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# Final Santa Clara Valley Habitat Plan

Santa Clara County, California

County of Santa Clara  
City of San José  
City of Morgan Hill  
City of Gilroy  
Santa Clara Valley Water District  
Santa Clara Valley Transportation Authority

August 2012





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*Prepared for:*

City of Gilroy  
City of Morgan Hill  
City of San José  
County of Santa Clara  
Santa Clara Valley Transportation Authority  
Santa Clara Valley Water District

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# Executive Summary

## Overview

The Santa Clara Valley Habitat Plan (Plan) provides a framework for promoting the protection and recovery of natural resources, including endangered species, while streamlining the permitting process for planned development, infrastructure, and maintenance activities. The Plan will allow the County of Santa Clara (County), the Santa Clara Valley Water District (SCVWD), the Santa Clara Valley Transportation Authority (VTA) and the cities of Gilroy, Morgan Hill, and San José (collectively, the Local Partners or Permittees) to receive endangered-species permits for activities and projects they conduct and those under their jurisdiction. The Santa Clara Valley Open Space Authority (Open Space Authority) has also contributed to Plan preparation. The Plan will protect, enhance, and restore natural resources in specific areas of Santa Clara County and contribute to the recovery of endangered species. Rather than separately permitting and mitigating individual projects, the Plan evaluates natural-resource impacts and mitigation requirements comprehensively in a way that is more efficient and effective for at-risk species and their essential habitats.

This Plan was developed in association with the U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG), and in consultation with stakeholder groups and the general public. The Permittees are asking the USFWS to issue them a 50-year permit that authorizes incidental take<sup>1</sup> of listed species under the federal Endangered Species Act (ESA). The Permittees are also asking CDFG to issue to them a 50-year permit that authorizes take<sup>2</sup> of all covered species under the Natural Community Conservation Planning Act (NCCP Act). This approach will allow the Permittees to streamline future mitigation requirements into one comprehensive program. In addition to obtaining take authorization for each participating agency's respective activities, the cities and County will be able to extend take authorization to project applicants under their jurisdiction.

USFWS and CDFG (collectively the Wildlife Agencies) will also provide assurances to the Permittees that no further commitments of funds, land, or water

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<sup>1</sup> *Take*, as defined by the Endangered Species Act, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” *Harm* is defined as “any act that kills or injures the species, including significant habitat modification.”

<sup>2</sup> *Take* is defined under the California Fish and Game Code as any action or attempt to “hunt, pursue, catch, capture, or kill.”

will be required to address impacts on covered species beyond that described in the Plan to address changed circumstances.

In addition to strengthening local control over land use and species protection, the Plan will provide a more efficient process for protecting natural resources by creating new habitat reserves that will be larger in scale, more ecologically valuable, and easier to manage than the individual mitigation sites created under the current approach.

## Geographic Scope

The study area (519,506 acres) is located in Santa Clara County in the central California Coast Range. The primary valley in the study area is the Santa Clara Valley, which stretches from San Francisco Bay to San Benito County. The Santa Clara Valley is bounded on the east by the Diablo Range, on the west by the Santa Cruz Mountains, and on the north by the San Francisco Bay shoreline. The study area was defined as the area in which covered activities will occur, impacts will be evaluated, and the majority of Plan conservation activities will be implemented. Some conservation actions for western burrowing owl will occur in the northern portion of the County in an area referred to as the expanded study area for burrowing owl conservation. The boundary of the study area was based on political, ecological, and hydrologic factors. The study area excludes tidally influenced portions of the Baylands. See **Figures 1-1 and 1-2** for maps of the study area, which covers 62% of the county.

The Santa Clara Valley is generally split into two geographic regions, the North Valley and the South Valley. The North Valley is extensively urbanized and is home to almost all of the County's residents. Thirteen of the County's fifteen cities are located in the North Valley, while the remaining two cities, Gilroy and Morgan Hill, are located in the South Valley. The South Valley remains predominantly rural, with the exception of Gilroy, Morgan Hill, small unincorporated community of San Martin, and scattered residential areas generally having parcels of five acres or less. Low-density residential developments are also scattered along the Valley floor and foothill areas. Almost the entire city of San José lies within the study area.

## Permit Term

The permit term is the time period in which all covered activities can receive take authorization under the Plan, consistent with the requirements of the Plan. The permit term is also the time in which all conservation actions must be successfully completed to offset the impacts of the covered activities. The Permittees will request permits from CDFG and USFWS. Each permit will be issued to all Permittees collectively. These permits will be tied to this Plan and to the Implementing Agreement. The Local Partners are seeking permits from the Wildlife Agencies with terms of 50 years. The permit term of 50 years was

selected because it allows for the full and successful implementation of the covered activities, the conservation strategy, the monitoring and adaptive management program, and the funding strategy.

## Covered Activities

A primary goal of this Plan is to obtain authorization for incidental take of covered species under the ESA and the NCCP Act for specific activities, called covered activities, which will occur in accordance with approved land-use and capital-improvement plans. Covered activities in the Plan fall into seven general categories.

- Urban development.
- In-stream capital projects.
- In-stream operations and maintenance.
- Rural capital projects
- Rural operations and maintenance
- Rural development
- Conservation strategy implementation (i.e., activities within the lands managed, enhanced, restored, and monitored to conserve the natural resources targeted by this Plan).

## Covered Species

This Plan provides take authorization for 18 listed and non-listed species (i.e., covered species) (**Table ES-1**). The 18 covered species were identified from a larger pool of 148 species in the region that are listed or that could become listed during the permit term. Species were selected for coverage based on their potential to be affected by covered activities, their occurrence in the study area, the adequacy of data for the species, and the species' current or foreseeable listing status. The Plan includes conservation measures to protect all 18 species selected for coverage under the Plan, whether or not they are currently listed. Accordingly, should any non-listed, covered species become listed during the permit term, additional conservation measures will not be required.

**Table ES-1. Covered Species**

<b>Invertebrates</b>	<b>Plants</b>
Bay checkerspot butterfly	Tiburon Indian paintbrush
<b>Amphibians and Reptiles</b>	Coyote ceanothus
California tiger salamander	Mount Hamilton thistle
California red-legged frog	Santa Clara Valley dudleya
Foothill yellow-legged frog	Fragrant fritillary
Western pond turtle	Loma Prieta hoita
<b>Birds</b>	Smooth lessingia
Western burrowing owl	Metcalf Canyon jewelflower
Least Bell's vireo	Most beautiful jewelflower
Tricolored blackbird	
<b>Mammals</b>	
San Joaquin kit fox	

## Conservation Strategy

The conservation strategy was designed to mitigate impacts on covered species and to contribute to the recovery of these species in the study area. The conservation strategy provides for the protection and enhancement of natural resources at multiple scales including landscape, natural-community, and species-specific levels.

The conservation strategy is based on a set of biological goals and objectives developed specifically for the Plan. Conservation actions were then identified to achieve these goals and objectives. The conservation strategy consists of the following major components:

- the acquisition of land and the creation of a Reserve System, including regional connections between protected areas;
- the long-term management, enhancement, and in some cases restoration of natural communities within the Reserve System;
- the development of a comprehensive aquatic conservation strategy to address the needs of covered amphibians and aquatic reptiles;
- the implementation of a comprehensive, long-term, adaptive management and monitoring program; and
- the implementation of avoidance and minimization measures on covered activities (called conditions on covered activities).

The general level of conservation effort for each covered species and natural community was determined by four broad criteria, namely:

- amount of impact from covered activities;

- proportion of the species' range or uniqueness of natural community in study area;
- rarity in study area; and
- stressors and threats in study area.

The benefits of the conservation strategy for each of the covered species are summarized in **Table ES-2**.

## Reserve System

The heart of the conservation strategy is the creation of a Reserve System that will protect an estimated 46,920 acres for the benefit of covered species, natural communities, biological diversity, and ecosystem function. Land acquisition and protection will create a network of reserves that accomplishes the following:

- Acquires and permanently protects a minimum of 33,205 acres and an estimated 33,629 acres of land for the benefit of covered species, natural communities, biological diversity, and ecosystem function.
- Permanently protects up to 13,291 acres of existing open space areas and enhances the long-term management and monitoring on those lands within the Reserve System. Therefore, the total size of the Reserve System will be an estimated 46,496 acres to 46,920 acres.
- Protects 100 miles of streams.
- Provides management and monitoring of habitats on protected lands to enhance populations of covered species and maintain ecosystem processes.
- Preserves major local and regional connections between key habitat areas and between existing protected areas.

The Plan describes a detailed but flexible process to assemble the Reserve System using acquisition of fee title or conservation easements from willing sellers and partnerships with other conservation organizations already active in the region. Reserve assembly will be required to stay ahead of the impacts of covered activities. All land acquisition will be completed by Year 45 of the permit term.

## Habitat Enhancement and Restoration

All terrestrial and aquatic land cover types in the Reserve System, including streams, will be enhanced to benefit covered and other native species. Wetland and aquatic land cover types will be restored, which involves the recovery of a natural community that has been ecologically degraded. Restoration actions will promote ecosystem recovery by enhancing functional processes, species composition, and community structure. To contribute to species recovery, a minimum of 90 acres of riparian woodland and scrub, wetlands, and ponds will be restored and a minimum of 1.0 mile of stream will be restored regardless of

the level of impacts. The remaining restoration will occur according to ratios of 1:1 or 2:1. If all predicted impacts occur, the Plan will restore up to 500 acres of riparian woodland and scrub, wetlands, and ponds, and up to 10.4 miles of streams to offset losses of these land cover types and to contribute to species recovery. Construction of all habitat-restoration or creation projects will be completed by Year 40 of the permit term.

## Adaptive Management and Monitoring

Adaptive management is a decision-making process promoting flexible management such that actions can be adjusted as uncertainties become better understood or as conditions change. Monitoring the outcomes of management is the foundation of an adaptive approach. The Plan contains detailed guidelines and recommendations for monitoring landscapes as well as the management, enhancement, or restoration of the following land cover types:

- Grassland, including serpentine grassland,
- Chaparral and northern coastal scrub,
- Oak and conifer woodland,
- Riverine and riparian forest, and
- Wetlands and ponds.

The Plan also contains guidelines for the monitoring and adaptive management of each covered species. The program will incorporate important principles of “learning by doing” into the operation of the Reserve System.

## Conditions on Covered Activities

A primary component of regional species protection is the development of comprehensive avoidance and minimization measures to help ensure that impacts from covered activities are reduced. As such, the Plan has developed broad principles for regional avoidance and minimization as well as specific conditions on covered activities. All Permittees and private applicants under the jurisdiction of Gilroy, Morgan Hill, San José, and the County will be required to adhere to these measures in order to receive take authorization. All parties covered by the Plan will submit an application package to receive or document take authorization.

As a regional conservation plan, one of the greatest benefits of the Plan is that mitigation for individual projects can be implemented systematically on a landscape scale. Regional avoidance and minimization concentrates protection in areas where it has the greatest value. By protecting high-quality areas and restricting covered activities in these areas, regional avoidance and minimization goals are supported. Conditions on covered activities are included that

- minimize impacts on sensitive natural communities and covered species,



- minimize impacts on select ground-dwelling wildlife species during project construction,
- ensure compliance with related state and federal wildlife laws,
- establish a comprehensive stream- and riparian-setback requirement, and
- protect water quality in wetlands and streams.

## Implementation

A new organization will be created to oversee assembly and operation of the Reserve System, oversee implementation of other conservation actions, develop and oversee the management and monitoring program, and ensure compliance with all terms of the Plan, permits, and Implementing Agreement. This *Implementing Entity* will be run by a Governing Board and Implementation Board that will consist of designated officials from each of the Permittees. The Implementing Entity will be advised by representatives of USFWS and CDFG, local land-management agencies, a technical advisory committee, a pool of science advisors, and a public advisory committee. It is anticipated that the Implementing Entity will partner with existing agencies and organizations to conduct a significant portion of its responsibilities.

The Plan also includes a detailed process for land acquisition from willing sellers and allowances for landowners to provide land in lieu of fees under certain circumstances.

## Cost and Funding

The cost of implementing the HCP/NCCP during the 50-year permit term is estimated at an average of approximately \$11 million annually. This includes the cost of land acquisition, Plan administration, habitat management, habitat restoration, biological monitoring, remedial measures, and a contingency. Plan costs were estimated from a detailed model of all expected cost components based on actual costs of tasks.

In addition, the Plan will create an endowment during the permit term to fund all needed implementation after the permit term. An endowment of \$90 million in current dollars is needed to generate average annual real returns of \$3.5 million to fund post-permit term management and monitoring of the Reserve System.

Plan funding will come from a number of different sources, including fees on private development and public infrastructure, conservation actions by local and state agencies, and state and federal funding. In general, non-fee funding from local, state, and federal sources will contribute to the conservation needs of the Plan (i.e., the contribution to species recovery). Additional information on funding sources is provided below:

- **Development Fees (Private).** This source includes developer mitigation fees or developer land dedications in lieu of fees.
- **Development Fees (Public Infrastructure).** This source includes fees paid by public infrastructure projects and operations that are covered by this Plan such as roads, flood-control and water-supply facilities, and other public projects.
- **Local Funding.** Non-fee local funding will take many forms, including continued and new investments in conservation actions and land acquisition by organizations such as the Santa Clara County Parks and Recreation Department (County Parks), local land management agencies, local land trusts, and local foundations.
- **State and Federal Funding.** This source includes federal and state grant programs that may fund land acquisition, habitat restoration, and other conservation actions. Some of these funding sources are generally available throughout the state and nation, while others can only be used to implement an approved HCP or NCCP.

A summary of the Plan costs and funding strategy is presented in **Table ES-3**.

The Plan establishes a framework for compliance with state and federal endangered-species laws and regulations that accommodates future growth in the study area. Without the Plan, public and private entities whose activities would affect listed species and their habitats would be required to obtain permits and approvals from USFWS and CDFG before undertaking those activities to mitigate the impacts of their activities on the listed species. Project proponents may also have to implement mitigation required by local jurisdictions based on an environmental analysis conducted for CEQA compliance. To comply with the NCCP Act, the Habitat Plan also provides for contribution to the recovery (“conservation”) of the covered species. Proponents of private and public development activities will benefit from this comprehensive approach in several ways: they will be assured of take coverage; they will avoid the time and expense of securing their own regulatory approvals; and they will have certainty and predictability with respect to their permit obligations. Consequently, the mitigation fees imposed to implement the Habitat Plan include some of the costs associated with the conservation activities. However, because a variety of groups will directly benefit from the Habitat Plan, those groups will also share in the responsibility for funding and otherwise implementing the Habitat Plan.

**Table ES-3. Habitat Plan Cost and Funding Overview**

Type	Amount (rounded to nearest \$10,000)
<b>Estimated Costs Over Permit Term</b>	
Land Acquisition	\$278,940,000
Reserve Management and Maintenance	\$95,360,000
Monitoring, Research, and Scientific Review	\$30,230,000
Western Burrowing Owl Conservation Strategy	\$8,570,000
Habitat Restoration/Creation	\$92,630,000
Program Administration	\$45,890,000
Contingency Fund	\$12,420,000
Plan Preparation Costs	\$3,010,000
Endowment Balance at End of Permit Term	\$90,140,000
<b>Total Estimated Costs</b>	<b>\$657,190,000</b>
<b>Projected Funding<sup>1</sup></b>	
<u>Fee Funding</u>	
Land Cover and Nitrogen Deposition Fees	\$175,460,000
Serpentine Fee	\$29,270,000
Wetland Fee	\$77,600,000
Burrowing Owl Fee	\$8,830,000
Temporary Impact Fees	\$16,010,000
Endowment Fee Component	\$36,500,000
Plan Preparation Fee Component	\$3,010,000
Participating Special Entity Fees	\$17,000,000
Total projected fee funding	\$363,680,000
<u>Non-Fee Funding</u>	
Land acquisition by County Parks	\$45,980,000
Land acquisition by other local land agencies, non-profits, foundations	\$77,270,000
Interest Income on Permit Period Funding	\$2,180,000
Endowment Investment Income	\$53,640,000
New Wildlife Agency funds (ESA Section 6, park bonds, etc.)	\$115,000,000
Total Non-Fee Funding	\$294,070,000
<b>Total Projected Funding</b>	<b>\$657,750,000</b>



**Table ES-2.** Summary Evaluation of Species Proposed for Coverage by the Santa Clara Valley Habitat Plan

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Bay checkerspot butterfly (<i>Euphydryas editha bayensis</i>)/(T/–)</b>			
<b>Status in Range:</b> Most historic populations occurring in the southern and eastern portions of the greater San Francisco Bay Area in serpentine grassland habitat have been extirpated, with the exception of south-central Santa Clara County (multiple locations) and one reintroduction site in San Mateo County. The reintroduction had very limited success, one adult was observed in 2008, the year following the reintroduction. Species is reported to be declining within its highly restricted range.	<b>Land Acquisition:</b> 3,800 acres modeled habitat acquired for Reserve System. 754 acres modeled habitat added to Reserve System from existing open space. Successful implementation of the Habitat Plan will result in the acquisition, protection, and management of a portion of most Bay checkerspot critical habitat units, all four of the core habitat areas as identified in Figure 5-A of the 1998 Serpentine Recovery Plan (Kirby, Metcalf, San Felipe, and Silver Creek Hills) to ensure occupancy of each of the four core habitat units, and at least three of the six (50%) satellite habitat units identified in the 1998 Serpentine Recovery Plan (W. Hills of Santa Clara Valley, Tulare Hill, Santa Teresa Hills, Calero, Communication Hill, or North of Llagas Avenue) by Year 45. Protection of sites will be prioritized according to threat, patch size, current occupancy, and prevalence of cool microsites.	<b>Permanent:</b> 300 acres of modeled primary habitat (3%), which includes a maximum of 300 acres of critical habitat.	Conduct annual surveys of post-diapause larvae in occupied habitat and of host plants and adult butterflies in suitable, unoccupied habitat. Evaluate species response to grassland management. Evaluate translocation efforts determine success of new population establishment.
<b>Status in Permit Area:</b> 8,621 acres of modeled habitat. 1,336 acres of modeled habitat currently protected in Type 1 open space. Species is abundant in multiple populations along the eastern foothills, from Silver Creek Hills down Coyote Ridge to Pigeon Point. Several populations regularly comprise more than 250,000 adult butterflies. South of Pigeon Point, species is present in small patches of grassland west of Coyote Reservoir. On west side of permit area, species is variably present in serpentine grasslands adjacent to Hale Avenue, adjacent to Kalana Avenue, in southern portions of the Santa Teresa Hills, in hills near Calero Reservoir, and on Tulare Hill. Species is reported to be declining in the permit area.	<b>Enhancement, Restoration, and Creation:</b> All acquired/added habitat enhanced to ensure occupancy of at least three of the six (50%) satellite habitat units identified in the 1998 Serpentine Recovery Plan (W. Hills of Santa Clara Valley, Tulare Hill, Santa Teresa Hills, Calero, Communication Hill , or North of Llagas Avenue). Conservation strategy specifies appropriate grazing regimes, prescribed burns, seeding with native forbs and grasses, and other appropriate vegetative management techniques to increase diversity of native plants on acquired species habitat. Translocation of species from core populations to unoccupied suitable habitat may be conducted in close coordination with the Wildlife Agencies.	<b>Temporary:</b> 54 acres of modeled primary habitat (<1%), which includes a maximum of 49 acres of critical habitat.	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts on this species from covered activities are minimized (Condition 13). This includes design measures to limit project footprint, buffer establishment, and landscaping restrictions. Surveys will be conducted to evaluate habitat quality and allow for development to occur as far as possible from high-quality habitat.			
<b>Net effects:</b> Up to 354 acres (4%) of modeled primary habitat, including 349 acres of critical habitat, will be affected by covered activities. The Reserve System will protect a minimum of 4,554 acres of modeled primary habitat as Type 1 open space all of which will be enhanced. This will result in a 341% increase of lands managed as primary habitat and a total of 68% of existing modeled habitat protected as Type 1 open space. Extensive land acquisition will protect all four of the core habitat areas as defined in the recovery plan for the species namely, Kirby, Metcalf, San Felipe, and Silver Creek Hills and secondary sites deemed essential for species recovery. Most critical habitat units will be partially protected with the successful implementation of the Habitat Plan (including lands currently protected as Type 1 open space). New reserves will ensure protection of the ranges of slopes, aspects, and microhabitats important to the species (LAND-G3, L5) and management of habitat to enhance populations of larval host plants and adult nectar sources to allow for natural migration across reserves (GRASS-1–4, LM-11). Targeted studies will allow for population translocation to unoccupied suitable habitat (GRASS-7) with close coordination with the Wildlife Agencies. Development guidelines will ensure that indirect impacts on this species from covered activities that occur outside the Reserve System are minimized. This includes limiting impacts to 3%, 11%, or 13% in any one core area (Condition 13). The Plan will contribute substantially to the recovery of the species in the permit area and, consequently, throughout its range through habitat acquisition, habitat enhancement, and avoidance or minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>California tiger salamander (<i>Ambystoma californiense</i>)/(T/T)</b>			
<b>Status in Range:</b> Endemic to grasslands of California, species is distributed in six populations: (1) Santa Rosa, Sonoma County; (2) Bay Area (central and southern Alameda, Santa Clara, western Stanislaus, western Merced, and San Benito Counties); (3) Central Valley (Yolo, Sacramento, Solano, eastern Contra Costa, northeast Alameda, San Joaquin, Stanislaus, Merced, and northwestern Madera Counties); (4) southern San Joaquin Valley (portions of Madera, central Fresno, and northern Tulare and Kings Counties); (5) Central Coast Range (southern Santa Cruz, Monterey, northern San Luis Obispo, and portions of western San Benito, Fresno, and Kern Counties); and (6) Santa Barbara County. Most populations occur at elevations of 200–1,500 feet, having been extirpated at lower elevations due to presence nonnative species in breeding ponds; however, extirpation has occurred across species range due to habitat loss. Species is reported to be declining throughout its limited California range.	<b>Land Acquisition:</b> 30,150 acres modeled habitat acquired for Reserve System. 11,745 acres modeled habitat added to Reserve System from existing open space.  Included in the acreages above are 50 to 104 acres of ponds and 15 to 80 acres of wetlands. Reserve System species occupancy requirements include 25% of ponds/wetlands by Year 30 and 30% by Year 45. Extensive land acquisition will occur in 7 critical habitat units. Target areas include areas adjacent to existing open space (Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, and Henry W. Coe State Park), and isolated areas (east of Uvas Reservoir) with known species occurrences. To ensure habitat connectivity, upland habitat between ponds/wetlands will be targeted between known occurrences in Santa Cruz foothills and Diablo Range, including areas near Santa Teresa Hills and Tulare Hill, and along Pajaro River south of Gilroy.	<b>Permanent:</b> 77 acres of modeled breeding habitat (7%). 12,855 acres of modeled non-breeding habitat (4%). 12,932 acres total, (4%), including up to 264 acres of critical habitat.	Conduct annual surveys of occupied and potential breeding and upland habitat. Evaluate species response to habitat enhancement, restoration, or creation. Determine species response to predator control programs. Determine effects of and response to additional threats, such as diseases and hybridization.
<b>Status in Permit Area:</b> 324,748 acres of modeled habitat (breeding and non-breeding). 45,767 acres of modeled habitat currently protected in Type 1 open space (breeding and non-breeding). Approximately 100 occurrence records (1990–2005) scattered throughout the permit area and on both sides of the Santa Clara valley, with large clusters of occurrences in Joseph D. Grant County Park. Eight historical breeding areas along the valley floor and along the US 101 corridor have been extirpated due to habitat conversion to development. Status of species in permit area is unknown.	<b>Enhancement, Restoration, and Creation:</b> 50 to 104 acres of ponds and 15 to 80 acres of wetlands enhanced. 20 to 72 acres of ponds created/ 20 to 75 acres of wetlands restored. Conservation Strategy specifies targeting sites to reduce habitat fragmentation and promote genetic exchange within the population. This includes sites within dispersal distance of known breeding sites to contribute to species recovery, as well as replacement of sites lost to covered activities. Site characteristics include hydrologic, geomorphic, and soil conditions to ensure successful restoration/creation. All acquired/added habitat will be enhanced to ensure occupancy of 30% of ponds and wetlands in each of the federal Recovery Units 4 and 6 in the Reserve System.	<b>Temporary:</b> 14 acres of modeled breeding habitat (1%). 1,529 acres of modeled non-breeding habitat (<1%). 1,543 acres total (<1%), including up to 119 acres of critical habitat.	
<b>Conditions on Covered Activities:</b> Development guidelines for wetlands and ponds (breeding habitat) and valley oak and blue oak woodlands (upland habitat) will minimize effects of covered activities (Conditions 12, 14). Stream and Riparian Setbacks, may also have ancillary benefits to this species. Although the streams themselves do not provide habitat, aquatic breeding sites and dispersal corridors may be located within the riparian areas protected by the setbacks (Condition 11). Project planning guidelines include maintenance of landscape connectivity, maintenance of site hydrology to the extent possible, and establishment of buffer/setback requirements. Construction guidelines include buffer zone establishment and fencing; staking of wetlands/ponds during construction; staff training by professional biologist; erosion control measures; and restrictions on seasonality of activities, vegetative management, use of heavy machinery, access points, and ground disturbance (Conditions 12, 14). Recreational use guidelines include leash law restrictions and public access limitations within reserve recreational use areas to prevent potential species impacts from domestic dogs (Condition 9).			
<b>Net effects:</b> Up to 91 acres (9%) of modeled breeding habitat and 14,384 acres (4%) of modeled non-breeding habitat, including 383 acres of critical habitat, will be affected by covered activities. The Reserve System will protect and enhance a minimum of 195 acres of modeled breeding habitat and 41,700 acres of non-breeding habitat as Type 1 open space. This will result in an increase of 92% of lands managed as species habitat and a total of 27% of modeled habitat protected as Type 1 open space. A minimum of 105 and up to 331 acres of aquatic habitat will be created/restored/enhanced in the Reserve System. Some of these sites will be suitable species habitat. A network of core reserves will protect large blocks of breeding/non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the permit area and movement between breeding sites (LAND-G2, OC1–5, WP4–7). Habitat management will improve quality of breeding habitat (e.g., predator eradication and access control programs, woody debris and native vegetation installation) and upland habitat (e.g., grassland management) (POND-1–4, 9–11, 13; GRASS-1, 2; LM-11–14; STUDIES-7, 8). Development guidelines will ensure that impacts on this species from covered activities outside the Reserve System are minimized (Conditions 9, 12, 14). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>California red-legged frog (<i>Rana aurora draytonii</i>)/(T/CSC)</b>			
<b>Status in Range:</b> Although the historical distribution extended south along the coast from Pt. Reyes National Seashore in Marin County and inland from Redding in Shasta County to northwestern Baja California, current distribution is limited to isolated patches in the Sierra Nevada, Northern Coast Ranges, and Santa Monica Mountains. Taxon remains common in the San Francisco Bay area and along the central coast. In southern California, taxon is believed extirpated from Santa Rosa Ecological Reserve but persists in the Santa Monica Mountains and in San Fransquito Canyon in Newhall. Species is reported to be declining at a global scale, as well as in California.	<b>Land Acquisition:</b> 31,300 acres modeled habitat acquired for Reserve System. 11,930 acres modeled habitat added to Reserve System from existing open space. Included in the acreages above are 15 to 80 acres of wetlands, 50 to 104 acres of ponds, and 100 miles of streams. 35% of ponds/wetlands in each of the federal Recovery Units 4 and 6 in the Reserve System will be occupied by species by Year 30 and with 40% by Year 45. Target areas include the East San Francisco Bay Recovery Unit, Critical Habitat Unit STC-1A, and areas adjacent to existing open space with known species occurrences, such as Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, and Henry W. Coe State Park.	<b>Permanent:</b> 299 acres of modeled primary habitat (3%). 12,937 acres of modeled secondary habitat (4%). 13,236 acres total (4%), including 1,023 acres of critical habitat.	Conduct preacquisition baseline surveys to document species occupancy, potential occupied breeding habitat, quality of upland habitat around occupied or potential breeding habitat, presence of predators, and presence of other threats that may affect reproductive success. Determine presence/absence of potential breeding adults through nighttime breeding season surveys. Conduct daytime surveys to determine local species population. Determine species response in occupied habitat to enhancement and restoration techniques. Evaluate quality and quantity of adjacent uplands using ground squirrel colony size and burrow density as a proxy. Determine species response to predator control programs. Monitor disease to prevent population epidemic.
<b>Status in Permit Area:</b> 341,773 acres of modeled habitat (primary and secondary). 46,253 acres of modeled habitat currently protected in Type 1 open space. Species has been extirpated from the urbanized valley floor and brackish marshlands bordering the San Francisco Bay due to habitat removal/degradation and invasive species predation. Species persists in the foothills and mountain ranges throughout the county. There are 93 documented occurrences, with adult frogs observed in creeks from Upper Alameda Creek (Sunol Regional Wilderness) south to Henry W. Coe State Park, with half the occurrences in Henry W. Coe State Park, 24 on private property, and the remainder on public properties of City of San José, Santa Clara Valley Water District, and Santa Clara County. Species is reported to be declining in the permit area.	<b>Enhancement, Restoration and Creation:</b> All acquired/added habitat enhanced to ensure occupancy of 25% of ponds and wetlands in the entire Reserve System. 10 to 50 acres of wetlands/ 50 to 104 acres of ponds enhanced. 20 to 45 acres of perennial wetlands restored. 20 to 72 acres of ponds created. Conservation Strategy specifies increasing habitat, enhancing connectivity among existing ponds and wetlands, and contributing to species recovery. Sites will be targeted to reduce habitat fragmentation and promote genetic exchange within the population, and will include hydrologic, geomorphic, and soil conditions to ensure successful restoration/creation.	<b>Temporary:</b> 116 acres of modeled primary habitat (1%). 1,489 acres of modeled secondary habitat (<1%). 1,605 acres total (<1%), including 276 acres of critical habitat.	
<b>Conditions on Covered Activities:</b> Development guidelines for wetlands, ponds, and streams (breeding habitat) and valley oak and blue oak woodlands (upland habitat) will ensure that impacts from covered activities are minimized (Conditions 4, 5, 11, 12, 14). Project planning guidelines include maintenance of landscape connectivity, maintenance of site hydrology to the extent possible, and establishment of buffer/setback requirements. Construction guidelines include buffer zone establishment and fencing; staking of wetlands/ponds during construction; staff training by professional biologist; erosion control measures; and restrictions on seasonality of activities, vegetative management, use of heavy machinery, access points, and ground disturbance. Recreational use guidelines include leash law restrictions and public access limitations within reserve recreational use areas to prevent potential species impacts from domestic dogs (Condition 9).			
<b>Net effects:</b> Up to 415 acres (4%) of modeled primary habitat and 14,426 acres (4%) of modeled secondary habitat will be affected by covered activities. The Reserve System will protect and enhance a minimum of 1,430 acres of modeled primary habitat and 41,800 acres of modeled secondary habitat. This will result in an increase of 93% of protected modeled habitat and a total of 26% of modeled habitat protected as Type 1 open space. A minimum of 100 and up to 271 acres of aquatic habitat will be created/restored/enhanced. Some of these sites will be suitable species habitat. A network of core reserves will protect large blocks of breeding/non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the permit area and movement between breeding sites (LAND-G2, OC1–5, WP4–7). Habitat management will improve quality of breeding habitat (e.g., predator eradication and access control programs, woody debris and native vegetation installation) and upland habitat (e.g., grassland management) (POND-1–4, 10, 11, 13; GRASS-1, 2; LM-10–13; STUDIES-7, 8). Development guidelines will ensure that impacts from covered activities outside the Reserve System are minimized (Conditions 3, 4, 5, 9, 11, 12, 14). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Foothill yellow-legged frog (<i>Rana boylei</i>)/(-/CSC)</b>			
<p><b>Status in Range:</b> Species range extends from west of the crest of the Cascade mountains in Oregon south to the Transverse Ranges in Los Angeles County, and in the Sierra Nevada foothills south to Kern County, excluding coastal areas south of northern San Luis Obispo County and foothills area south of Fresno County, where the species is apparently extirpated. Known elevation range extends from near sea level to ~6,700 feet. Species is still common along the northern California coast as well as in suitable habitat in the Diablo Range in Alameda, western Stanislaus, Santa Clara, San Benito, and western Fresno Counties. Species is reported to be declining at a global scale, as well as within California.</p>	<p><b>Land Acquisition:</b> 80 stream miles of modeled habitat acquired for Reserve System. 24 stream miles of modeled habitat added to Reserve System from existing open space. Protect occupied habitat in the Reserve System in at least four of the watersheds in Figure 3-6. Occupied habitat within the Reserve System is defined as perennial streams with an observation of egg masses by Year 45. Occupancy will be demonstrated upstream of dams that present permanent barriers to the species or on streams unaffected by dam operations and must be in both the Diablo Range and in the Santa Cruz Mountains. Target areas include streams that have, or historically had, perennial flows and cobblestone substrate.</p>	<p><b>Permanent:</b> 1.9 stream miles of modeled primary habitat (1%). 4.8 stream miles of modeled secondary habitat (4%). 6.7 stream miles total (1%).</p>	<p>Assess habitat quality and conduct visual detection baseline surveys (to determine species presence/absence) in potential species habitat prior to Reserve System land acquisition. Document species baseline levels using in-depth population surveys, as warranted. Determine changes in number of egg masses (i.e., weekly egg mass surveys during peak egg-laying period) to evaluate species response to enhancement and restoration of stream habitat and riparian corridors (e.g., addition of cobblestone substrate, riparian plantings, livestock exclusion). Conduct a directed study to inform how and when reservoir releases should be implemented during egg-laying months. Determine species response to predator control programs. Monitor disease to prevent population epidemic. Evaluate species response to barrier removal.</p>
<p><b>Status in Permit Area:</b> 690 stream miles of modeled habitat. 119 miles of modeled habitat currently protected in Type 1 open space (primary and secondary habitat). Species has been virtually extirpated from the lowland areas and from many of the perennial streams below major reservoirs; however, species remains abundant in the foothills and mountains of eastern Santa Clara County. Species is still found in the upper reaches of most perennial streams, including Coyote Creek and nearly all the streams of the Pajaro watershed. Species is reported to be declining within the permit area.</p>	<p><b>Enhancement, Restoration, and Creation:</b> All stream miles of acquired/added habitat enhanced to ensure occupancy in at least three of the watersheds in the Reserve System. 1 to 10.4 stream miles restored. Conservation Strategy specifies targeting reaches of perennial streams above the Uvas, Calero, Chesbro, Anderson, or Coyote Reservoirs, Uvas Creek below Uvas Reservoir, Little Arthur Creek, Upper Penitencia Creek, Alamitos Creek, and Guadalupe Creek. Riparian vegetation will be seeded/planted to create structural diversity, provide overhead cover, and regulate stream temperature. Cobblestone substrate will be increased in _ stream miles within model habitat to increase breeding habitat suitability. Uvas Reservoir releases will be adjusted to create necessary seasonal flow regimes. Herbicide and other vegetative treatments will be selectively applied to avoid species impacts.</p>	<p><b>Temporary:</b> 0.7 stream miles of modeled primary habitat (&lt;1%). 1.3 stream miles of modeled secondary habitat (&lt;1%). 2.0 stream miles total (&lt;1%).</p>	
<p><b>Conditions on Covered Activities:</b> Development and operations and maintenance guidelines will ensure that impacts from covered activities are avoided or minimized through maintenance of hydrologic conditions and protection of water quality (Condition 3), stream avoidance and minimization for in-stream projects (Condition 4), BMPs for in-stream operations and maintenance (Condition 5), rural development design requirements (Condition 7), preparation and implementation of a Reserve System recreation plan (Condition 9), and riparian setbacks (Condition 11). Conditions include but are not limited to: creation of landscape features to maintain preproject hydrograph, remove pollutants and sediments from surface runoff prior to stream entry, and reduce runoff velocity; development of construction sediment and erosion management plans; installation of fish passage mechanisms during in-stream work; and bank stabilization. Recreational use guidelines include leash law restrictions and public access limitations within reserve recreational use areas to prevent potential species impacts from domestic dogs (Condition 9).</p>			
<p><b>Net effects:</b> Up to 8.7 stream miles (&lt;1%) of modeled habitat will be affected by covered activities. The Reserve System will protect and enhance a minimum of 37 stream miles of modeled primary habitat and 67 stream miles of modeled secondary habitat. This will result in an 88% increase of protected modeled habitat as Type 1 open space and protection of a total of 32% of modeled habitat protected as Type 1 open space. Within the Reserve System a minimum of 1 and up to 10.4 stream miles will be restored. Some of these sites will be suitable species habitat. Engineered channels will be replaced to restore floodplain connectivity (STREAM-4, 5). Protection of streams with perennial flows will target reaches with high habitat value or restoration potential (LAND-R5). Restoration and enhancement of perennial streams (e.g., selective herbicide applications, riparian plantings, increase in cobblestone substrate, appropriate flow regimes) will ensure improvement of habitat quality and breeding success (LM-14; STREAM-2, 4, 5, 8; STUDIES-6). Development guidelines will ensure that impacts from covered activities outside the Reserve System are minimized (Conditions 3,-5, 7, 9, 11). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.</p>			



Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Western pond turtle (<i>Clemmys marmorata</i>)/(-/CSC)</b>			
<b>Status in Range:</b> Species range extends from most Pacific slope drainages from Klickitat County, Washington, along the Columbia River, to Arroyo Santa Domingo in northern Baja California. In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders. Occurring in 90% of its historic California range in the Central Valley and west of the Sierra Nevada, its numbers have been greatly reduced. Species is reported to be declining at a global scale; however, the species status in California is unknown due to lack of data.	<b>Land Acquisition:</b> 27,000 acres modeled habitat acquired for Reserve System. 11,900 acres modeled habitat added to Reserve System from existing open space. Included in the acreages above are 50 to 104 acres of ponds, 10 to 50 acres of perennial wetlands, and 100 stream miles. 20% of ponds and wetlands in the entire Reserve System will be occupied by western pond turtles by Year 30. 25% of ponds and wetlands in the entire Reserve System will be occupied by western pond turtles by Year 45. Target areas include stream segments or ponds that currently provide or could provide high-quality basking, breeding, and nesting habitat. This includes land between existing ponds and wetlands that provide a linked matrix of pond, wetland, and upland habitat.	<b>Permanent:</b> 1,824 acres of modeled primary habitat (2%). 7,825 acres of modeled secondary habitat (3%). 9,649 acres total (3%).	Assess habitat quality and document baseline population levels in potential habitat within Reserve System acquisitions. Determine population response (i.e., changes in the average number of individuals basking) to enhancement and restoration of occupied habitat. Assess effects of habitat management (e.g., livestock exclusion) on nesting and basking habitat and determine population response.
<b>Status in Permit Area:</b> 314,916 acres of modeled habitat. 44,967 acres of modeled habitat currently protected in Type 1 open space (primary and secondary habitat). Species occurs throughout the Coyote Creek drainage from its upper reaches in Henry W. Coe State Park to the urbanized reaches in San José; however, the majority of known occurrences are in the southern half of the county, namely Uvas and Llagas Creeks where they enter reservoirs. Species status is unknown in the permit area due to lack of targeted studies; reported occurrences are thought to be biased by incidental observation, consequently, occurrences may be more extensive throughout the permit area.	<b>Enhancement, Restoration, and Creation:</b> All acquired/added habitat enhanced to ensure occupancy of 25% of ponds and wetlands in the entire Reserve System. 50 to 104 acres of ponds enhanced. 20 to 72 acres of ponds created. 20 to 45 acres of perennial wetlands restored. 1 to 10.4 stream miles restored. Habitat management of riverine and riparian forest and scrub, wetlands, and ponds will increase the quality and quantity of species habitat within the permit area. Artificial basking substrate and woody debris will be installed to create suitable basking sites.	<b>Temporary:</b> 440 acres of modeled primary habitat (<1%). 986 acres of modeled secondary habitat (<1%). 1,426 acres total (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines for wetlands, ponds, and streams and valley oak and blue oak woodlands will ensure that impacts from covered activities are avoided and minimized (Conditions 4, 5, 11, 12 & 14). Project planning guidelines include maintenance of landscape connectivity, maintenance of site hydrology to the extent possible, and establishment of buffer/setback requirements. Construction guidelines include buffer zone establishment and fencing; staking of wetlands/ponds during construction; staff training by professional biologist; erosion control measures; and restrictions on seasonality of activities, vegetative management, use of heavy machinery, access points, and ground disturbance. Recreational use guidelines include leash law restrictions and public access limitations within reserve recreational use areas to prevent potential species impacts from domestic dogs (Condition 9).			
<b>Net effects:</b> Up to 2,264 acres (3%) of modeled primary habitat and 8,811 acres (4%) of secondary habitat will be affected by covered activities. The Reserve System will protect a minimum of 9,800 acres of modeled primary habitat and 29,100 acres of modeled secondary habitat. All habitat within Reserve System will be enhanced. This will result in an 87% increase of lands managed as species habitat and protection of a total of 27% of modeled habitat protected as Type 1 open space. Within the Reserve System 100 stream miles, a minimum of 50 and up to 104 acres of ponds, and a minimum of 10 and up to 50 acres of perennial wetlands will be protected. A minimum of 20 and up to 72 ponds will be created. A minimum of 20 and up to 45 acres of perennial wetlands and minimum of 1 and up to 10.4 stream miles will be restored. A portion of these stream and aquatic natural community acquisition, creation, and restoration sites will provide suitable species habitat. A network of core reserves will protect large blocks of breeding/non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the permit area and movement between breeding sites (LAND-G2, OC1–5, WP4–7). Habitat management will improve quality of breeding habitat (e.g., predator eradication and access control programs, woody debris and native vegetation installation) and upland habitat (e.g., grassland management) (STREAM-1–3; LM-11–14; POND-1–4, 9–11, 13; GRASS-1, 2; STUDIES-7–9). Development guidelines will ensure that impacts from covered activities outside the Reserve System are minimized (Condition 9, 12, 14). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.			

Table ES-2. Continued

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Western burrowing owl (<i>Athene cunicularia hypugea</i>)/(MBTA/CSC)</b>			
<p><b>Status in Range:</b> Species is found throughout western North American, west of the Mississippi River and south into Mexico. In California, species range extends through the lowlands south and west from north central California to Mexico, with small, scattered populations occurring in the Great Basin and the desert regions of the southwestern part of the state. Species is absent from the coast north of Sonoma County and from high mountain areas. Populations have been greatly reduced or extirpated from most of the San Francisco Bay Area and along the California coast to Los Angeles. The remaining major population densities are in the Central and Imperial Valleys. Species is reported to be declining at a global scale, as well as within California.</p>	<p><b>Land Acquisition, Easement, or Management Agreement:</b>  <u>Overwintering Habitat</u>  17,000 acres modeled overwintering habitat acquired for Reserve System.  4,310 acres modeled overwintering habitat added to Reserve System from existing open space.  <u>Nesting Habitat</u>  5,300 acres occupied and potential nesting habitat managed with permanent long-term management plans by Year 45. A minimum of 600 of these 5,300 acres will be occupied nesting habitat acquired in fee title or easement for the Reserve System.  The geographic breakdown of nesting habitat would include the following minimums: 3,700 acres in the North San José/Baylands region, 800 acres in the Gilroy region, 530 acres in the Morgan Hill region, and 270 acres in the South San José region.</p>	<p><b>Permanent:</b>  9,671 acres of modeled overwintering only habitat (7%).  198 acres of modeled occupied nesting habitat.  4,000 acres of modeled potential nesting habitat.</p>	<p>Assess habitat quality and document available nesting, foraging, and overwintering habitat within the Reserve System. Determine species movements and identify habitat corridors during breeding and wintering seasons. Use multiple approaches (e.g., track nesting pairs, density and distribution of California ground squirrels) to determine species response (i.e., nesting success, site fidelity) to habitat protection and enhancement. Track species response to grassland management by monitoring California ground squirrel colonies to determine burrow and prey availability.</p>
<p><b>Status in Permit Area:</b>  197,869 acres modeled habitat.  13,586 acres of modeled habitat currently protected in Type 1 open space.  There are 25 extant species occurrences in the permit area. Many of these occurrence records include sitings of several breeding individuals over multiple years. Core populations of breeding and overwintering populations of western burrowing owls continue to be at the San José International Airport. Species is reported to be declining within the permit area.</p>	<p><b>Enhancement, Restoration, and Creation:</b>  All acquired/added/managed habitat enhanced.  Conservation Strategy specifies using grassland management to enhance habitat quality through vegetation management, creating artificial burrows and increasing extent of ground squirrel colonies, encouraging the colonization of new areas, and ceasing rodenticide use to the extent possible.</p>	<p><b>Temporary:</b>  762 acres of modeled overwintering habitat (&lt;1%). 20 acres of modeled occupied nesting habitat (&lt;1%).  604 acres of modeled potential nesting habitat (&lt;1%).</p>	
<p><b>Conditions on Covered Activities:</b> Development and operations and maintenance guidelines will ensure that impacts from covered activities are avoided or minimized (Condition 15). Species-specific surveys will be conducted during project planning phase, and potential impacts to occupied breeding habitat will be mapped. Preconstruction surveys will establish species presence/absence. Project monitoring will be coordinated with other regional efforts. Avoidance and minimization measures, including the establishment of a 250-ft buffer zone, will avoid all nest sites that could be disturbed by project construction throughout the breeding season. During the non-breeding season, active burrows will be avoided by the establishment of a 160-ft border, and exclusion doors will be put in place for 48 hours prior to excavation. All project monitoring will be conducted by a qualified biologist.</p>			
<p><b>Net effects:</b> Up to 10,433 acres (8%) of modeled overwintering habitat, 218 acres of estimated occupied nesting habitat, and 4,604 acres of potential nesting habitat will be affected by covered activities. The Reserve System will protect or manage a minimum of 22,300 acres of species habitat (acquire 17,000 acres of modeled overwintering only and 600 acres of occupied nesting habitat, protect or manage another 4,700 acres of occupied or potential nesting habitat) An additional 4,310 acres of modeled overwintering habitat will be incorporated from existing open space. All habitat within the Reserve System or under long-term management will be enhanced. The Implementing Entity will maintain or increase the size of the breeding and overwintering burrowing owl population and increase the distribution of breeding and overwintering burrowing owls in the permit area and the expanded burrowing owl conservation area. New reserves will ensure protection of both breeding and overwintering habitat on the valley floor and in the Diablo Range (LAND G8-10). Habitat management will focus on enhancement of breeding habitat (i.e., vegetation management, artificial burrow creation, limiting rodenticide use, increased ground squirrel colonization) in four regions: North San José/Baylands, Gilroy, Morgan Hill, and South San José (GRASS-5, 6, 8, 9). Development guidelines will ensure that impacts from covered activities that occur outside the Reserve System are minimized (Condition 15). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.</p>			

Table ES-2. Continued

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Least Bell's vireo (<i>Vireo bellii pusillus</i>)/(E, MBTA/E)</b>			
<b>Status in Range:</b> A migratory species that breeds in North America and overwinters primarily along the Pacific Coast in southern Mexico. Breeding range extends from north central to southwestern U.S. and into central Mexico. Additional breeding sites have been documented from southwestern California and northwestern Baja California to central South Dakota, east to Illinois and northwestern Indiana, south to the gulf coast and into southern Sonora. Recently, breeding individuals have been reported as far north as southern Santa Clara County along Llagas Creek and in southeastern Monterey, western Merced, and Stanislaus Counties, demonstrating that the species may be expanding back into its historical range. Species is reported to be declining at a global scale, as well as in California; however, there is recent evidence of range extensions in San Joaquin Valley.	<b>Land Acquisition:</b> 460acres modeled habitat acquired for Reserve System. 2 acres modeled habitat added to Reserve System from existing open space. Included in the acreages above are the 290 to 592 acres of riparian forest and scrub and California alluvial sycamore woodland habitat that will be acquired to meet riparian natural community acquisition commitments.  Target areas include riparian woodland habitat in Uvas, Llagas, and Pacheco watersheds.	<b>Permanent:</b> 72 acres of modeled primary habitat (2%).	Survey riparian woodland during the nesting season to document and monitor species status. Evaluate species response to habitat enhancement and restoration. Document nesting success, once a population becomes established in the permit area.
<b>Status in Permit Area:</b> 3,097 acres of modeled habitat. 65 acres of modeled habitat currently protected in Type 1 open space.  Due to isolated, infrequent sighting of the species and lack of survey efforts, the extent of the species range in the permit area is not well understood. Species sightings have occurred along Llagas Creek between SR 152 and the Pajaro River, east of Gilroy (evidence of breeding, nest found) and Coyote Creek near Coyote Creek Golf Club (breeding behavior observed, no nest found). Species is poorly understood in the permit area, but may be increasing.	<b>Enhancement, Restoration, and Creation:</b> All acquired/added habitat enhanced, including 290 to 592 acres of acquired riparian forest/scrub and California alluvial sycamore woodland. Fifty to 353 acres of riparian forest/scrub and California alluvial sycamore woodland will be restored. Target areas include Uvas/Carnadero Creek, Llagas Creek between SR 152 and its confluence with Pajaro River, and sections of Pacheco Creek in Santa Clara County between Pacheco Lake and San Felipe Lake. Geomorphic and ecological stream functions, including floodplain benches, will be restored. All riparian mitigation will occur in Uvas, Llagas, and Pacheco watersheds. Native vegetation will be planted/seeded to promote continuity of riparian corridors and provide mosaic of successional stages. Predator control program, if needed, will be implemented.	<b>Temporary:</b> 43 acres of modeled primary habitat (1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure impacts are avoided and minimized (Condition 16). Surveys will identify and map nesting habitat and active nests for projects occurring in modeled habitat. If nesting habitat is identified, impacts will be avoided and minimized during the breeding season (March 15–July 31). Avoidance measures include relocating impacts at least 250 feet from modeled breeding habitat or conducting work outside of the breeding season. If impacts on least Bell's vireo habitat (occupied or not) are not fully avoided by a 250-foot buffer, preconstruction surveys will be required. Preconstruction surveys will document species presence/absence and habitat use. Occupied nests and previous nesting sites (for up to 3 years) will be avoided during the breeding season (March 15–July 31) with a 250-foot buffer. Required buffers may be reduced on a case-by-case basis as evaluated by the Implementing Entity in coordination with the Wildlife Agencies. If a nest is found, the Wildlife Agencies will be notified immediately. All construction or maintenance personnel must participate in training lead by a qualified biologist.			
<b>Net effects:</b> The Plan does not authorize take of least Bell's vireo in the form of direct injury or mortality. Loss of nests or eggs is also not authorized under the Plan. Up to 115 acres (4%) of modeled primary habitat will be affected by covered activities. The Reserve System will protect a minimum of 462 acres of modeled primary habitat. All species habitat within the Reserve System will be enhanced. This will result in a 711% increase of protected modeled habitat and a total of 17% of modeled habitat protected as Type 1 open space. To meet riparian natural community goals, a minimum of 290, and up 592, acres of riparian forest and scrub will be acquired and enhanced, and a minimum of 50 and up to 353 acres will be restored. Some of these sites may be suitable species habitat. New reserves will increase habitat connectivity by targeting areas along rivers (LAND–R2, R8). Habitat management will ensure improvement of habitat quality and favor increased reproductive success through riparian woodland and forest enhancement/restoration (e.g., predator control program, planting native vegetation) (LM-11; STREAM-2–5, 7). Development guidelines will ensure that impacts on this species from covered activities outside the Reserve System are avoided or minimized (Condition 16). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct species impacts.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Tricolored blackbird (<i>Agelaius tricolor</i>)/(MBTA/CSC)</b>			
<b>Status in Range:</b> Species is endemic to the west coast of North America, mostly in California. The breeding population is concentrated in the Central Valley with scattered sites occurring in Oregon, Washington, Nevada, and the western coast of Baja California. In California, the historic breeding range included Sacramento and San Joaquin Valleys, lowlands of the Sierra Nevada south to Kern County, the coast region from Sonoma County to the Mexican border, and sporadically on the Modoc Plateau. Species has experienced major declines since 1994. Species is reported to be declining at a global scale, as well as within California.	<b>Land Acquisition:</b> 19,000 acres modeled habitat acquired for Reserve System. 3,840 acres modeled habitat added to Reserve System from existing open space. Included in the acreages above are 50 to 104 acres of ponds and 10 to 50 acres of perennial wetlands. Target areas include suitable breeding habitat in dryland farming or ranching complexes in Coyote Valley and the Diablo Hills, prioritizing currently and recently occupied and historic breeding sites. In addition, foraging habitat will be acquired within 2 miles of known breeding sites.	<b>Permanent:</b> 276 acres of modeled primary habitat (3%). 10,317 acres of modeled secondary habitat (8%). 10,593 acres total (8%).	Assess habitat quality, species occupancy, and colony size of all suitable freshwater wetland or pond habitat in Reserve System. Determine breeding habitat connectivity in permit area. Evaluate species response to habitat enhancement, restoration, or creation. Monitor nesting colony response to nonnative plant removal. Determine need for predator control programs.
<b>Status in Permit Area:</b> 140,291 acres of modeled habitat. 11,037 acres of modeled habitat currently protected in Type 1 open space (primary and secondary habitat). Although consistently present in the permit area, species' distribution in permit area remains sporadic and ephemeral. There are few documented colony occurrences, comprising 150–200 individuals. Because species wanders considerably during the breeding season, individuals could successfully breed in the permit area if suitable breeding and/or foraging habitat were available. Breeding colonies often go unreported because of individuals' similar appearance to that of red-winged blackbird. Data are insufficient to characterize species status in the permit area.	<b>Enhancement, Restoration, and Creation:</b> All acquired/added habitat enhanced. 50 to 104 acres of ponds enhanced. 10 to 50 acres of perennial wetlands enhanced. 20 to 72 acres of ponds created. 20 to 45 acres of perennial wetlands restored. As part of the Conservation Strategy, private landowners will be offered incentives to ensure that farming and ranching practices support foraging habitat. Exclusion fencing will be installed to prevent entry of livestock and feral pigs into breeding habitat. Riparian vegetation will be planted to attract nesting birds. Engineered channels will be replaced where feasible.	<b>Temporary:</b> 93 acres of modeled primary habitat (1%). 768 acres of modeled secondary habitat (<1%). 861 acres total (<1%).	
<b>Conditions on Covered Activities:</b> Development and operations and maintenance guidelines ensure that impacts from covered activities are avoided or minimized (Condition 17). During the project planning phase, a qualified biologist will survey and map potential species nesting habitat. Potential nesting habitat identified by these or any other surveys, will be mapped and direct impacts to potential nesting habitat avoided and other impacts minimized. Avoidance measures include relocating impacts away from the potential nesting habitat. If a project is unable to avoid impacts on species nest colonies by locating construction and staging activities at least 250 feet from the outer edge of all hydric vegetation associated with the colony, preconstruction surveys will be required. Preconstruction surveys will conclude no more than two calendar days prior to construction. Covered activities must avoid species nesting colonies (currently occupied or occupied within the past 5 years) and associated habitat with a 250-ft no-activity buffer zone around the outer edge of all hydric vegetation associated with the colony. Required buffers may be adjusted on a case-by-case basis as evaluated by the Implementing Entity in coordination with the Wildlife Agencies. A construction monitor will be present during breeding season construction when an active colony is present.			
<b>Net effects:</b> No impacts are allowed to active tricolored blackbird colonies. The Plan does not authorize the removal of historic and active breeding sites. Up to 11,454 acres (8%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 22,840 acres of modeled species habitat. All habitat within Reserve System will be enhanced. This will result in a 207% increase of lands managed as species habitat and a total of 24% of modeled habitat protected as Type 1 open space. A minimum of 50 and up to 104 acres of ponds and a minimum of 10 and up to 50 acres of perennial wetlands will be acquired and enhanced. A minimum of 20 and up to 72 acres of ponds will be created and a minimum of 20 and up to 45 acres of perennial wetlands will be restored. Some of these aquatic natural community acquisition, creation, and restoration sites will provide suitable species habitat. New reserves will ensure protection of at least four currently occupied or historic breeding sites and nearby foraging habitat (LAND WP 8). Land owners will be offered incentives to enhance breeding and foraging habitat on their property (POND-14, 15). Habitat management will focus on restoration and enhancement of ponds, freshwater marshes, and seasonal wetlands (e.g., fencing installation, restoration with native vegetation, replacement of engineered channels) to improve quality of breeding and foraging habitat (POND-1, 6, 8–10, 17, 18; STREAM-4). Development guidelines will ensure that impacts from covered activities that occur outside the Reserve System are minimized (Condition 17). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement/restoration, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>San Joaquin kit fox (<i>Vulpes macrotis mutica</i>)/(E/T)</b>			
<b>Status in Range:</b> Endemic to California, the historic range is estimated to have extended from Contra Costa and San Joaquin Counties in the north to Kern County in the south. Kit foxes currently inhabit some areas of the San Joaquin Valley floor and the surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains from Kern County north to Contra Costa, Alameda, and San Joaquin Counties. Known occurrences in Alameda, Contra Costa, Fresno, Kern, Kings, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Stanislaus, and Tulare Counties, with the largest extant populations in Kern County and San Luis Obispo County in the Carrizo Plain Area. Species is reported to be declining throughout its limited California range.	<b>Land Acquisition:</b> 4,100 of modeled secondary habitat acquired for Reserve System. Land acquisition adheres to species Recovery Plan. Focus on building connections between the more isolated satellite populations to contributes to <i>the Level A Strategy</i> to “work toward the establishment of a viable complex of kit fox populations (i.e., a viable metapopulation) on private and public lands throughout its geographic range”. Plan supports the Habitat <i>Protection and Population Interchange Recovery Action xiv</i> to “Protect existing kit fox habitat in the northern, northeastern, and northwestern segments of their geographic range...” (U.S. Fish and Wildlife Service 1998). Target areas include north and south of SR 152 and east of SR 152/156 interchange that have the highest potential to support species.	<b>Permanent:</b> 198 acres of modeled secondary habitat (<1%). 28 acres of modeled secondary habitat (low use) (1%). 226 acres total (<1%).	Document and assess all potential den sites for occupancy and wildlife corridor use of SR 152 crossings (e.g., bridges, culverts). Evaluate distribution changes of California ground squirrels (prey base) in response to grassland management. Determine how SR 152 affects habitat connectivity using other terrestrial mammals’ movement patterns and response to barriers.
<b>Status in Permit Area:</b> 40,892 acres of modeled habitat. 5,067 acres of modeled habitat currently protected in Type 1 open space (secondary habitat, secondary habitat low use). Four occurrence records for 1972–2002 report both den use and movement through the permit area. Genetic studies demonstrate that interbreeding occurs between individuals of the San Luis Reservoir population, southeast of the permit area, and those of Alameda and Costa Counties. It is assumed that the Pacheco–Santa Ana watershed in the southeastern part of Santa Clara County provides movement habitat between these two areas. Species status in the permit area is unknown due to lack of data.	<b>Enhancement, Restoration, and Creation:</b> All habitat enhanced. Specified management of native vegetation and limited the use of rodenticides will support sustainable prey population. Species passage will be improved across SR 152 with the placement of culverts or free span bridges and removal of median barriers. Fencing will be installed to encourage culvert and bridge use to avoid roadway crossings or to use sections without median barriers. Public education will be conducted to inform landowners on land use techniques that are more compatible with species movement and use.	<b>Temporary:</b> 46 acres of modeled secondary habitat (<1%). 6 acres of modeled secondary habitat (low use) (<1%). 52 acres total (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines ensure impacts are avoided or minimized (Condition 18). Surveys for potential breeding and denning sites will be required for projects occurring within modeled habitat as defined by this Plan. If the project does not fully avoid impacts on potential dens, preconstruction surveys will be required. Preconstruction surveys will conclude no more than two calendar days prior to construction. Preconstruction surveys written results will be submitted to USFWS and CDFG within two calendar days after survey completion and before ground disturbance start. If individuals or suitable dens are identified in survey area, minimization measures will be implemented (Condition 18). For example, during covered activities, dens will be monitored; unoccupied dens will be destroyed and use of occupied (non-natal) dens will be discouraged. During construction monitoring, a trained biologist will establish exclusion zones at least 50 feet for atypical and potential dens and at least 100 feet for known dens. If an occupied natal den is found, USFWS and CDFG will be notified immediately and the den will not be destroyed until the pups and adults have vacated and then only after further consultation with USFWS and CDFG. All construction or maintenance personnel must participate in training.			
<b>Net effects:</b> The Plan does not authorize take of San Joaquin kit fox in the form of injury or mortality. Up to 278 acres (<1%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 4,100 acres of modeled secondary habitat. Within the Reserve System all habitat will be enhanced. This will result in an increase of 81% of protected modeled habitat and a total of 22% of modeled habitat protected as Type 1 open space and. Land acquisition and habitat enhancement includes elements of the <i>Level A Strategy</i> , <i>Population Interchange Recovery Action xiv</i> , and <i>Population Ecology Management Recovery Action i</i> of the species recovery plan. A network of core reserves and movement routes will protect a critical linkage for San Joaquin kit fox through the permit area to adjacent populations in Alameda and Contra Costa Counties (LAND-G9). Grassland and oak woodlands will be managed to support a sustainable prey population (GRASS-5, 6). Barriers to passage will be removed and structural improvements to facilitate movement will be implemented to improve species passage across SR 152 (LM-1–5). A public awareness campaign will encourage species-compatible land uses outside the Reserve System (GRASS-10). Development guidelines will ensure that impacts on this species from covered activities that occur outside the Reserve System are minimized (Condition 18). The Plan is likely to benefit the species in the permit area through habitat acquisition, habitat enhancement, and avoidance and minimization of direct impacts on the species.			

Table ES-2. Continued

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Tiburon Indian paintbrush (<i>Castilleja affinis</i> ssp. <i>neglecta</i>)/(E/T, 1B)</b>			
<b>Status in California:</b> 9 known occurrences. Endemic to California, its range is approximately 30 by 70 miles (north–south), and occurs in Marin, Napa, and Santa Clara Counties. Species is reported to be stable throughout its limited California range.	<b>Land Acquisition:</b> 1 occurrence added from existing open space to Reserve System.	<b>Permanent:</b> 0 occurrences.	Evaluate species response to management and habitat enhancement (e.g., grazing regimes) annually and after significant events that may have strong effects on occurrence size (e.g. fire, severe weather). Identify limiting factors of occurrence expansion through targeted research. Develop appropriate monitoring protocols to study occurrence response to experimental grazing exclusion. Monitor potential threats (e.g. feral pigs, prescribed burns) to occurrence.
<b>Status in Permit Area:</b> 2 of 9 known occurrences. No occurrences currently protected in Type 1 open space. 1 occurrence is on private land as a mitigation site for expansion of the Kirby Canyon Landfill. The easement for this occurrence will expire in 2034. The site is currently monitored and managed by the Kirby Canyon Butterfly Trust. The second occurrence, located in the North Canyon, is on private land. At the time this Plan was being developed, the landowners was in the process of finalizing a conservation easement on the site.	<b>Enhancement, Restoration, and Creation:</b> Increase the size of occurrence to at least 2,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation Strategy specifies identification through targeted studies of factors limiting the expansion of extant occurrences including management and microsite needs at all life stages. Effects of livestock grazing on species will be determined. Research results will be incorporated into management plans to mitigate or remove limiting factors.	<b>Temporary:</b> N/A	
<b>Conditions on Covered Activities:</b> Plant surveys will be required during appropriate season period ( <b>Table 6-10</b> ) if a project site occurs in an area mapped as land cover associated with Tiburon Indian paintbrush ( <b>Table 3-6; Figure 3-10</b> ). The condition of any new occurrences that may be found during the permit as a result of project surveys will be documented to ensure they are not affected. Exotic plants and recreational use will be controlled in reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13).			
<b>Net effects:</b> No occurrences of this species will be lost as a result of covered activities. The Reserve System will protect one occurrence that is now under easement which will expire in 2034. Plan implementation will result in 100% of known occurrence protected in Type 1 open space and species management will increase the total occurrence to at least 2,000. Management will enhance habitat quality for this species, and targeted research will be conducted on factors limiting the extent of current occurrences (STUDIES-5, 16). The Reserve System occurrence will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). Development guidelines will ensure that impacts on currently undiscovered occurrences from covered activities outside the Reserve System are avoided (Condition 9). Guidelines for reserve management will ensure that recreational use will avoid species impacts (Condition 9). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Coyote ceanothus (<i>Ceanothus ferrisiae</i>)(E/-/1B)</b>			
<b>Status in California:</b> 3 known occurrences. Species is endemic to Santa Clara County where it occurs in the Mt. Hamilton Range. Species is reported to be declining throughout its limited California range.	<b>Land Acquisition:</b> 5 occurrences acquired for Reserve System, 3 known, extant occurrences and 2 newly discovered occurrences.	<b>Permanent:</b> No more than 3,650 individuals or 5% of the Anderson Dam occurrence, whichever is less.	Conduct baseline surveys of known occurrences to determine occurrence size and demography upon land acquisition. Evaluate species response to management and habitat enhancement (e.g., controlled burns, `grazing regimes) annually and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., increases in reservoir levels) to occurrences as needed.
<b>Status in Permit Area:</b> 3 of 3 known occurrences. 0 occurrences currently protected in Type 1 open space All three existing occurrences are located in the Morgan Hill area; two are near Anderson Reservoir east of U.S. 101 and the third is on the west side of U.S. 101.	<b>Enhancement, Restoration, and Creation:</b> Up to 2 new occurrences created, in lieu of acquisition, if acquisition of naturally-occurring occurrences is infeasible. Increase each occurrence to at least 5,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation strategy specifies targeting the east side of Coyote Valley to site new occurrence and increase species range. Targeted research will determine limiting factors in expansion of extant occurrences, appropriate and viable propagation or planting techniques, seed sampling and harvest techniques, and will indentify suitable locations and methods for occurrence establishment. Fire and alternative vegetative management in chaparral community will be used to maintain structural diversity and canopy gaps and promote regeneration to benefit species maintenance and regeneration. Success criteria will be developed by the Implementing Entity and approved by USFWS and CDFG prior to occurrence creation.	<b>Temporary:</b> No known occurrences (0%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with coyote ceanothus ( <b>Table 3-6; Figure 3-10</b> ). Individuals to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled within reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> No more than 3,650 individuals or 5% of the Anderson Dam occurrences (including both occurrences on either side of the Dam), whichever is less, will be affected by covered activities. The Reserve System will protect 3 currently unprotected known occurrences in the permit area and 2 new occurrences will be created if acquisition of any newly-discovered occurrences is infeasible (LAND-P1, STUDIES-13–15). This will result in protection of a 100% of known occurrences and a total of 5 occurrences in Type 1 open space. Management will enhance habitat quality for this species, and targeted research will be conducted on factors limiting the extent of current occurrences (STUDIES-5, 11; CHAP-1, 2; LM-8, 12). As part of species Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants. All known occurrences in the Reserve System will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Table ES-2. Continued

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Mt. Hamilton thistle (<i>Cirsium fontinale</i> var. <i>campylon</i>)(-/-/1B)</b>			
<b>Status in California:</b> 48 known occurrences. Species is endemic to the San Francisco Bay area, with two clusters of occurrences: one in the Mt. Hamilton Ranges, the other in the hills adjacent to the northern Santa Clara Valley, occurring on serpentine soils in seeps and springs and along intermittent and perennial streams, at elevations of 320–2,900 feet. Occurs in Santa Clara, Stanislaus, and Alameda Counties. Data are insufficient to characterize species status across its range; however, species is believed to be stable. Further study is necessary to confirm.	<b>Land Acquisition:</b> 20 known occurrences acquired for Reserve System. 2 known occurrences added to Reserve System from existing open space. 150 acres modeled habitat acres modeled habitat acquired for Reserve System. 60 acres modeled habitat added to Reserve System from existing open space. Target sites include drainages or spring systems that support species, such as, spring-fed serpentine drainages on Coyote Ridge that flow west into Coyote Creek, drainages that flow into San Felipe Creek, and other suitable habitat in the Santa Cruz Mountains between Calero County Park and Almaden Quicksilver County Park, and on Tulare Hill. An effort will be made to stratify protection and acquire sites on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.	<b>Permanent:</b> 6 known occurrences; 26 acres of modeled primary habitat (5%).	Determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on Reserve System acquisitions. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., insect herbivores, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 40 of 48 known occurrences; 487 acres of modeled habitat. 2 occurrences currently protected in Type 1 open space. 55 acres of modeled habitat currently protected in Type 1 open space. There are occurrence estimates for 34 of the known occurrences of this species, from as early as 1983 up to as recently as 2006. These estimates range from 1 to 4,500 individuals, and the total estimated population of all occurrences is 28,933. The total number may be higher as species numbers are likely to fluctuate from year to year in response to annual fluctuations in rainfall and runoff into serpentine seeps.	<b>Enhancement, Restoration, and Creation:</b> Increase each occurrence to at least 2,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation Strategy specifies determining limiting factors to occurrence expansion, including life stage and microsite needs, through targeted research. Livestock will be experimentally excluded to determine occurrence response. Hydrologic systems will be managed and maintained to provide species habitat.	<b>Temporary:</b> 4 acres of modeled primary habitat (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with Mt. Hamilton thistle ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat [not mentioned above] (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled within reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 6 known occurrences and up to 30 acres (6%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 210 acres of modeled habitat, including 22 known occurrences (LAND-P6). This will result in a 384% increase of lands managed as species habitat, 24 total occurrences managed in Type 1 open space, and 54% of modeled habitat protected as Type 1 open space. Habitat management includes maintaining hydrologic systems required for species habitat. Targeted studies will be conducted to test the effects on livestock on occurrences and to investigate factors that can be used to identify suitable locations for new occurrence establishment, propagation or planting techniques, alternative techniques for occurrence establishment, and factors limiting the extent of current occurrences (STUDIES-5, 16). As part of Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants. All known occurrences in the Reserve System will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			



Table ES-2. Continued

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Santa Clara Valley dudleya (<i>Dudleya abramsii</i> ssp. <i>setchellii</i>)(E/-/1B)</b>			
<b>Status in California:</b> 209 known occurrences. Species is endemic to Santa Clara County, found in the vicinity of Coyote Valley from San José south about 20 miles to San Martin, at elevations of 300–900 feet. Data are insufficient to characterize species status across its range; however, species is believed to be stable, although further study is necessary to confirm.	<b>Land Acquisition:</b> 44 known occurrences acquired for Reserve System. 11 known occurrences added to Reserve System from existing open space. Sites will be stratified to protect occurrence on both sides of Coyote Valley to ensure geographic diversity in protected occurrences. This includes the majority of known occurrences along Coyote Ridge, in the Santa Teresa Hills and Tulare Hill (4), west of Calero County Park (2), and north of Morgan Hill (1). Incorporation of portions of Santa Teresa, Calero, and Almaden Quicksilver County Parks into the Reserve System add 10 occurrences for existing open space to be protected as Type 1 open space. The protected land will include a buffer of 150 meters (500 feet), if feasible, around each occurrence to reduce external influences and allow expansion of the occurrence.	<b>Permanent:</b> 11 known occurrences.	Conduct baseline occurrence surveys in all suitable habitat to evaluate known occurrences and document new occurrences. Delineate operational “boundary” for discrete occurrences for monitoring and management purposes. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) annually and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., fires, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 207 of 209 known occurrences. 2 occurrences currently protected in Type 1 open space. Occurrence estimates are only available for 46 occurrences that total 72,500 individuals.	<b>Enhancement, Restoration, and Creation:</b> Increase each occurrence to at least 2,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation Strategy specifies seeding or transplanting adults from large occurrences to suitable unoccupied rock outcrops in existing occurrences. Limiting factors to occurrence expansion, including life stage and microsite needs, will be determined through targeted research. Livestock will be experimentally excluded to determine occurrence response.	<b>Temporary:</b> N/A	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts on Santa Clara Valley dudleya from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with Santa Clara Valley dudleya ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques, and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled within reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 11 known will be affected by covered activities. The Reserve System will protect 55 known occurrences in permit area (LAND-P2). This will result in 57 occurrences protected and managed in Type 1 open space. Management will enhance habitat quality for this species, and targeted studies will be conducted on factors limiting the extent of current occurrences in order to increase each occurrence to at least 2,000 individuals (STUDIES-5, 16). As part of Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants. All known occurrences in the Reserve System will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Fragrant fritillary (<i>Fritillaria liliacea</i>)/(-/-/1B)</b>			
<b>Status in California:</b> 59 known occurrences. Species is endemic to western central California, ranging from Sonoma and Solano Counties south to Monterey County.	<b>Land Acquisition:</b> 3 occurrences acquired for Reserve System. 1 known occurrence added to Reserve System from existing open space. 23,000 acres modeled habitat acquired for Reserve System. 4,000 acres modeled habitat added to Reserve System from existing open space. 3 unprotected occurrences will be targeted for acquisition. Two occurrences will be protected along Coyote Ridge southeast of Metcalf Canyon and northeast of Morgan Hill. The third occurrence will be located outside of Metcalf Canyon, preferably east of the valley. A fourth occurrence in Calero County Park will be incorporated into the Reserve System as Type 1 open space. The protected land will include a 500-foot buffer around each occurrence to reduce external influences and allow expansion of the occurrence if biologically feasible and appropriate.	<b>Permanent:</b> 1 known occurrence; 550 acres of modeled primary habitat (6%). 2,729 acres of modeled secondary habitat (2%). 3,279 acres total (2%).	Determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on Reserve System acquisitions. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., fires, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 8 of 59 known occurrences; 165,455 acres modeled habitat. 0 occurrences currently protected in Type 1 open space; 16,371 acres of modeled habitat currently protected in Type 1 open space (primary and secondary habitat). 35 occurrences have size estimates, for a total of 16,383 individuals.	<b>Enhancement, Restoration, and Creation:</b> Conservation Strategy specifies identification of factors limiting occurrence expansion, factors affecting establishment and maintenance of new occurrences, life stage and specific microsite needs, and effects of land management on occurrence establishment and survival.	<b>Temporary:</b> 59 acres of modeled primary habitat (<1%). 655 acres of modeled secondary habitat (<1%). 714 acres total (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized. Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with fragrant fritillary ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat [not mentioned above] (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled in reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 1 known occurrence and 3,993 acres (2%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 27,000 acres of modeled habitat, including four known occurrences (LAND-P8). This will result in a 226% increase of lands managed as species habitat, protection and management of a total of 4 occurrences, and 26% of modeled habitat as Type 1 open space. Targeted studies will identify factors limiting occurrence expansion and test the effects of livestock grazing (STUDIES-5, 16). All known occurrences in the Reserve System will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Loma Prieta hoita (<i>Hoita strobilina</i>)(-/-/1B)</b>			
<b>Status in California:</b> 26 known occurrences. Endemic to California, species occurs primarily in the Santa Cruz Mountains of Santa Clara and Santa Cruz Counties. The species also occurs in the Diablo Range in Santa Clara, Alameda, and Contra Costa Counties. Data are insufficient to determine global and regional status.	<b>Land Acquisition:</b> 1 known occurrence acquired for Reserve System. 3 known occurrences added to Reserve System from existing open space. 10,000 acres modeled habitat acquired for Reserve System. 4,100 acres modeled habitat added to Reserve System from existing open space. Targeted acquisition includes an occurrence on the east side of the Santa Clara Valley, just east of US 101, south of Motorcycle Park. Three additional occurrences will be added to the Reserve System as Type 1 open space through the incorporation of Santa Teresa, Almaden Quicksilver, and Calero County Parks. All occurrences will protect a biologically appropriate buffer around known occurrence to reduce external influences and allow for occurrence expansion.	<b>Permanent:</b> No known occurrences; 2,117 acres of modeled primary habitat (2%) 266 acres of modeled secondary habitat (1%). 2,383 acres total (2%).	Determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on Reserve System acquisitions. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., feral pig rooting) to occurrences as needed.
<b>Status in Permit Area:</b> 14 of 26 known occurrences; 121,871 acres of modeled habitat. 1 occurrence currently protected in Type 1 open space. 17,276 acres of modeled habitat currently protected in Type 1 open space (primary and secondary habitat).	<b>Enhancement, Restoration, and Creation:</b> Conservation Strategy specifies identifying factors limiting the expansion of known occurrences, life stage and specific microsite needs, and effects of land management on occurrence establishment and survival.	<b>Temporary:</b> 413 acres of modeled primary habitat (<1%). 60 acres of modeled secondary habitat (<1%). 473 acres (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with Loma Prieta hoita ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled in reserves to benefit the species (Condition 9).			
<b>Net effects:</b> No known occurrences and up to 2,856 acres (2%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 14,100 acres of modeled habitat, including four known occurrence (LAND-P12). This will result in an 82% increase of lands managed as species habitat, a total of 5 managed occurrences in Type 1 open space, and 26% of modeled habitat protected as Type 1 open space. Targeted studies will identify factors limiting occurrence expansion (STUDIES-5). All known occurrences in the Reserve System will be represented in a permanent conservation seed bank unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Smooth lessingia (<i>Lessingia micradenia</i> var. <i>glabrata</i>)</b> (-/-1B)			
<b>Status in California:</b> 39 known occurrences. Species is endemic to Santa Clara County on the eastern slopes of the Santa Cruz Mountains and the hills adjacent to the Santa Clara Valley. Data are insufficient to determine global and regional status; however, all documented occurrences are presumed to be extant.	<b>Land Acquisition:</b> 7 known or new occurrences acquired for Reserve System, 5 known occurrences added to Reserve System from existing open space. 12 new occurrences (if discovered) acquired for Reserve System. 4,000 acres modeled habitat acquired for Reserve System. 1,100 acres modeled habitat added to Reserve System from existing open space. Targeted acquisition are located on the west side of US 101 in the Santa Cruz Mountains foothills, on serpentine areas between Tulare Hill and Mount Madonna County Park. Two additional occurrences will be added to the Reserve System as Type 1 open space from Calero and Mount Madonna County Parks. All occurrences will be protected by a 500-foot buffer around occurrences to reduce external influences and allow for occurrence expansion.	<b>Permanent:</b> 6 known occurrences; 550 acres of modeled primary habitat (5%).	Determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on Reserve System acquisitions. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., fires, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 39 of 39 known occurrences; 10,491 acres modeled habitat. 3 occurrences currently protected in Type 1 open space; 1,268 acres of modeled habitat currently protected in Type 1 open space. 16 of the 33 known occurrences have size estimates totaling 95,213.	<b>Enhancement, Restoration, and Creation:</b> Up to 12 occurrences created, in lieu of acquisition, if acquisition of naturally-occurring occurrences is infeasible. Increase the size of each occurrence to at least 2,000 individuals. Conservation Strategy specifies targeted research to identify limiting factors to occurrence expansion, including life stage and microsite needs, and effects of land management on occurrence establishment and survival. Livestock will be experimentally excluded to determine occurrence response. Success criteria will be developed by the Implementing Entity and approved by USFWS and CDFG prior to occurrence creation.	<b>Temporary:</b> 68 acres of modeled primary habitat (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with smooth lessingia ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled in reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 6 known occurrences and 618 acres (6%) of modeled habitat will be affected by covered activities. The Reserve System will protect a minimum of 5,100 acres of modeled habitat, including 12 known occurrences (LAND-P7). At least 12 new occurrences will be found and acquired or established in suitable unoccupied habitat. This will result in a 427% increase of lands managed as species habitat, protection and management of 27 occurrences in Type 1 open space, and protection of a total of 61% of modeled habitat as Type 1 open space. Targeted studies will be conducted to identify factors limiting the extent of current occurrences and to test the effects of livestock grazing on occurrences (STUDIES-5, 14, 16). As part of Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants. All known occurrences in the Reserve System will be represented unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Metcalf Canyon jewelflower (<i>Streptanthus albidus</i> ssp. <i>albidus</i>)/(FE/1B)</b>			
<b>Status in California:</b> 11 known occurrences. Species is endemic to Santa Clara County, CA, with its range extending approximately 20 miles from San José south to Anderson Lake. Species is reported to be declining throughout its limited California range.	<b>Land Acquisition:</b> 3 known occurrences acquired for Reserve System. 10 new occurrences, if found, acquired for Reserve System. 3,200 acres modeled habitat acquired for Reserve System. 1,000 acres modeled habitat added to Reserve System from existing open space. Acquire additional land on north side of Tulare Hill for reintroduction site. The protected land will include a buffer of 150 meters (500 feet), if feasible, around each occurrence to reduce external influences and allow expansion of the occurrence. 68 occurrences of an unidentified jewelflower on Coyote Ridge near Metcalf Canyon will likely be protected in the Reserve System. Due to the proximity of known occurrences, some are likely to be Metcalf Canyon jewelflower.	<b>Permanent:</b> 2 known occurrences; 550 acres of modeled primary habitat (7%).	Conduct baseline occurrence surveys in all suitable habitat to evaluate known occurrences and document new occurrences. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) annually and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., fires, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 10 of 11 known occurrences; 8,105 acres modeled habitat. 1 occurrence currently protected in Type 1 open space; 984 acres of modeled habitat currently protected in Type 1 open space.	<b>Enhancement, Restoration, and Creation:</b> Up to 10 new occurrences created, in lieu of acquisition, if acquisition of naturally-occurring occurrences is infeasible. Increase each occurrence to at least 2,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation Strategy specifies targeting Tulare Hill on west side of valley for occurrence creation. Targeted research will be conducted to identify limiting factors in expansion of extant occurrences, appropriate and viable propagation or planting techniques, and seed sampling and harvest techniques, as well as to determine suitable locations and methods for occurrence establishment. Success criteria will be developed by the Implementing Entity and approved by USFWS and CDFG prior to occurrence creation.	<b>Temporary:</b> 62 acres of modeled primary habitat (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with Metcalf Canyon jewelflower ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques, and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled within reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 2 known occurrences and 612 acres (8%) of modeled habitat will be affected by covered activities. The Reserve System will protect 4,200 acres of modeled habitat, including 3 of 10 known occurrences that are currently unprotected in the permit area. At least 10 new occurrences will be found and acquired and/or created in suitable unoccupied habitat (LAND-P3, P4). This will result in a 427% increase of lands managed as species habitat, protection of a total of 4 known occurrences in Type 1 open space and 10 newly discovered and/or created occurrences, and protection of 64% of modeled habitat as Type 1 open space. Conservation Strategy implementation will increase the total number of extant occurrences to 21 in California, including 14 occurrences protected in Type 1 open space. Management will enhance habitat quality for this species, and targeted studies will be conducted on factors limiting the extent of current occurrences (STUDIES 5, 14, 15, 17). As part of Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants. All known occurrences in the Reserve System will be represented unless collection would pose a threat to the occurrence’s continued existence (STUDIES-12).The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<b>Most beautiful jewelflower (<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>)/(-/-1B)</b>			
<b>Status in California:</b> 86 known occurrences. Species is endemic to California, found in the northern South Coast Ranges of Contra Costa, Alameda, and Santa Clara Counties. Species is reported to be declining throughout its limited California range.	<b>Land Acquisition:</b> 9 known occurrences acquired for Reserve System. 8 known occurrences added to the Reserve System from existing open space. 4,000 acres modeled habitat acquired for Reserve System. 1,700 acres modeled habitat added to Reserve System from existing open space. Target areas include suitable habitat and occurrences along Coyote Ridge, in Santa Teresa Hills, west of Chesbro Reservoir, near Morgan Hill and in the southern end of the permit area in the Santa Cruz Mountain foothills. Eight occurrences will be added to the Reserve System from Alamaden Quicksilver, Calero, and Santa Teresa County Parks as Type 1 open space. All occurrences will be buffered by 150 meters (500 feet) to reduce external influences and allow expansion of the occurrence. 68 occurrences of an unidentified jewelflower on Coyote Ridge near Metcalf Canyon will likely be acquired for Reserve System. Due to the proximity of known occurrences, some are likely to be most beautiful jewelflower.	<b>Permanent:</b> 6 known occurrences; 550 acres of modeled primary habitat (4%).	Determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on Reserve System acquisitions. Evaluate species response to management and habitat enhancement (e.g., grazing regimes) and after significant events that may have strong effects on occurrence size (e.g., fire, severe weather). Target research to identify factors that limit occurrence expansion. Monitor potential threats (e.g., fires, livestock grazing) to occurrences as needed.
<b>Status in Permit Area:</b> 39 of 86 known occurrences; 14,362 acres modeled habitat. 3 occurrences currently protected in Type 1 open space; 1,500 acres of modeled habitat currently protected in Type 1 open space (primary and secondary habitat).	<b>Enhancement, Restoration, and Creation:</b> Increase each occurrence to at least 2,000 individuals (number will be adjusted as necessary pending research carried out during Plan implementation to assure viable populations of this species). Conservation Strategy specifies investigation of species reproductive biology and demography. Targeted research will identify factors limiting occurrence expansion, life stage and specific microsite needs, and effects of land management on occurrence establishment and survival.	<b>Temporary:</b> 92 acres of modeled primary habitat (<1%).	
<b>Conditions on Covered Activities:</b> Development guidelines will ensure that impacts from covered activities are minimized (Condition 20). Plant surveys will be required during the appropriate season period ( <b>Table 6-10</b> ) if the project site occurs in an area mapped as land cover associated with most beautiful jewelflower ( <b>Table 3-6; Figure 3-10</b> ). Occurrences to be removed by covered activities will be salvaged to the extent possible using appropriate plant salvage techniques and a new separate occurrence will be established in suitable habitat (Condition 19). The condition of each covered plant occurrence will be documented to ensure that occurrences are protected within the Reserve System are in as good or better condition than those lost to covered activities. Exotic plants and recreational use will be controlled in reserves to benefit the species (Condition 9). Covered activities will avoid serpentine land cover types whenever feasible during project planning (Condition 13). If serpentine cannot be avoided, minimization measures described in Condition 13 will be followed.			
<b>Net effects:</b> Up to 6 known occurrences and 642 acres (4%) of modeled primary habitat will be affected by covered activities. The Reserve System will protect a minimum of 5,700 acres of modeled habitat, including 17 known occurrences (LAND-P5). This will result in a 380% increase of lands managed as species habitat and protection of a total of 20 occurrences as Type 1 open space, and a total of 50% of modeled habitat protected as Type 1 open space. Targeted studies will identify factors limiting the extent of current occurrences and suitable propagation or planting techniques for new occurrence establishment (STUDIES-5, 14, 17). As part of Recovery Plan implementation, a permanent conservation seed bank will be established in the National Collection of Endangered Plants of all known occurrence is Reserve System (STUDIES-12). The Plan is likely to benefit the species in the Reserve System and throughout its range through habitat acquisition/enhancement/restoration, occurrence augmentation, and avoidance and minimization of direct impacts on the species.			

Species/Status (Federal/State/CNPS) <sup>1</sup>	Acquisition <sup>2</sup> , Enhancement, Restoration, and Creation	Impacts <sup>3,4</sup>	Monitoring <sup>5</sup>
<sup>1</sup> Status <b>Federal</b> E      Federally Listed as Endangered T      Federally Listed as Threatened MBTA   Migratory Bird Treaty Act <b>State</b> E      State Listed as Endangered T      State Listed as Threatened SR      State Listed as Rare CSC      California Special Concern Species FP      Fully Protected <b>California Native Plant Society</b> 1B      Rare, Threatened, or Endangered in California and Elsewhere			<sup>2</sup> All land acquired as part of Reserve System will be protected as Type 1 open space. This includes land added to the Reserve System from existing open space. For many covered plant species, additional impacts are allowed under certain circumstances if additional occurrences are discovered during the permit term. See Table 5-16 for details on occurrence acquisition requirements if additional occurrences are discovered and impacts require additional protection. <sup>3</sup> Habitat was only modeled within the permit area. When models were developed, impacts are provided in terms of percent of modeled habitat. See Section 5.3.1 and plant species-specific conservation strategy discussions (Sections 5.4.12–5.4.21) for details for plant acquisition requirements (i.e., condition, location, timing). <sup>4</sup> It is expected that new occurrences of many of the covered plants will be discovered both within the impact areas and the Reserve System. In many cases, it is warranted to allow additional impacts to covered plants beyond the occurrences known at this time, as long as new occurrences are found and protected in the Reserve System before the impacts occur. A summary of number of known occurrences required in the permit area, increased take limit, and required number of occurrences protected in the Reserve System is provided in <b>Table 5-16</b> . <sup>5</sup> For complete suggested monitoring tasks, see Chapter 7, Section 7.3.3.





# Acknowledgements

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# Chapter 1

## Introduction

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## 1.1 Overview

The Santa Clara Valley Habitat Plan (or Plan) is intended to provide an effective framework to protect, enhance, and restore natural resources in specific areas of Santa Clara County, while improving and streamlining the environmental permitting process for impacts on threatened and endangered species. The entities listed below have prepared this Plan.

- County of Santa Clara (County).
- City of San José.
- City of Morgan Hill.
- City of Gilroy.
- Santa Clara Valley Water District (SCVWD).
- Santa Clara Valley Transportation Authority (VTA).

These entities are collectively referred to as the *Local Partners*. The Local Partners intend the Plan to allow for reasonable development, growth, and needed infrastructure construction and maintenance while accommodating the Plan's conservation goals and complying with state and federal regulatory requirements. The Local Partners are collectively known as the *Permittees*.

### 1.1.1 Mission Statement

The Local Partners and key stakeholders, participating in a goal-setting process, developed a set of broad program goals that collectively serve as the mission statement for this Plan. The program goals are divided into five themes.

## Biological Resources and Conservation

- Protect, enhance, and restore ecosystem integrity and functionality for threatened and endangered species.
- Enhance the diversity of plant and animal communities.
- Conserve habitat and contribute to the recovery of species listed or likely to be listed under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA).

## Multi-Purpose and Benefit Plan

- Preserve and enhance watersheds to protect beneficial uses of water and to provide flood protection for Santa Clara County.
- Provide appropriate levels of public access in habitat areas in a manner compatible with conservation goals.
- Facilitate economic growth compatible with approved local land use plans.
- Preserve agricultural viability.
- Integrate the strategies of the Plan with public and private potential partners wherever possible.
- Develop a Plan with a variety of implementation measures to attract multiple funding sources.
- Allocate costs of the Plan equitably among the Local Partners.
- Develop Plan strategies that build on the governmental capacities of all Local Partner jurisdictions.

## Public Participation

- Provide an open public process in developing and implementing the Plan.

## Regulatory Compliance

- Provide a comprehensive, coordinated, and standardized mitigation and compensation plan such that regulations on public and private actions will be applied equally and consistently, reducing delays, expenses, and regulatory duplication.
- Streamline the endangered species permitting process for the covered activities.



## Effective and Efficient Implementation

- Provide a basis for the Permittees to obtain endangered species permits for public projects including those associated with uninterrupted water supply, flood protection, watershed activities, recreation, transportation, and other government functions.
- Provide a basis for private projects to gain permit authorization through local agencies.
- Create efficient reserve unit management plans that complement existing monitoring and adaptive management efforts of the Permittees and other land management entities in the study area and the region.

### 1.1.2 Purpose

The purpose of this Plan is to protect and enhance ecological diversity and function in the greater portion of Santa Clara County, while allowing appropriate and compatible growth and development in accordance with applicable laws. To this end, the Plan describes how to avoid, minimize, and mitigate impacts on endangered and threatened species, thereby addressing the permitting requirements relevant to these species for activities conducted in the Plan area by the Permittees. These activities (i.e., *covered activities*) include urban and rural growth and a variety of road, water, and other needed infrastructure construction and maintenance activities. The Plan also describes the responsibilities associated with operating and maintaining the new habitat reserves that will be created to mitigate anticipated impacts resulting from growth and development activities.

This Plan is both a habitat conservation plan (HCP) intended to fulfill the requirements of the ESA and a natural community conservation plan (NCCP) to fulfill the requirements of the California Natural Community Conservation Planning Act (NCCP Act). As an NCCP, this Plan not only addresses impact mitigation, but will also contribute to the recovery and delisting of listed species and help preclude the need to list additional species in the future. The Local Partners are voluntarily preparing this Plan as an NCCP to provide a higher level of conservation for the benefit of natural resources in Santa Clara County than is strictly required for ESA compliance. An NCCP also provides greater regulatory benefits and greater opportunities for state and federal funding than do other permitting options under state law.

In summary, this Plan will achieve the specific objectives listed below.

- Provide comprehensive species, natural community, landscape, and ecosystem conservation in the study area.
- Contribute to the recovery of endangered species in Santa Clara County and northern California.
- Protect and enhance biological and ecological diversity in the county.

- Establish a regional system of habitat reserves to preserve, enhance, restore, manage, and monitor native species and the habitats and ecosystems upon which they depend.
- Enhance and restore stream and riparian systems outside the habitat reserves to provide additional benefit to native fish and other stream-dwelling species.
- Allow issuance of permits to the Permittees for lawful incidental take<sup>1</sup> of species listed as threatened or endangered pursuant to ESA and CESA.
- Provide a means for the local agencies receiving permits to extend the incidental take authorization to private entities subject to their jurisdiction, bringing endangered species permitting under local control.
- Streamline and simplify the process for future incidental take authorization of currently nonlisted species that may become listed during the permit term.
- Standardize avoidance, minimization, mitigation, and compensation requirements of the ESA, CESA, NCCP Act, California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA), and other applicable laws and regulations relating to biological and natural resources within the planning area, so that public and private actions will be governed equally and consistently, thus reducing delays, expenses, and regulatory duplication.
- Provide a less costly, more efficient project review process that will result in greater conservation than the current project-by-project, species-by-species endangered species compliance process.

Incidental take authorization (referred to as *take authorization* in this document) will be granted by the U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Game (CDFG) (collectively, the Wildlife Agencies). The Local Partners are asking the Wildlife Agencies to issue permits that authorize incidental take of covered species. The Plan includes a conservation strategy to compensate for impacts on these covered species. The conservation strategy provides for the conservation and management of covered species and their habitats.

It is anticipated that the Plan will allow issuance of incidental take permits under the ESA and the NCCP Act by the Wildlife Agencies to the local jurisdictions. The Permittees will then be able to use those permits for their own operations, maintenance, and capital projects. The Permittees will also be able to extend the take authorization to private entities conducting activities covered by this Plan and under their jurisdiction<sup>2</sup> (see Chapter 2 for a detailed summary of activities eligible for these permits). The Wildlife Agencies will also provide assurances to the Permittees and Plan participants that no further commitments of funds, land,

<sup>1</sup> *Take* as defined by the ESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” *Incidental take* is take that is incidental to, and not intended as part of, an otherwise lawful activity.

<sup>2</sup> Note that the HCP and NCCP permits will only authorize the incidental take of covered species. Most activities will also require additional local authorization (e.g., CEQA), and some activities will also require additional state or federal authorization.

or water will be required to address impacts on covered species beyond that described in the Plan as long as the Permittees are adequately implementing the Plan (see Chapter 10).

The Plan will also be used to comply with Section 7 of the ESA for projects with federal agency involvement. See Section 1.3.1 *Federal and State Endangered Species Laws* for more details.

### 1.1.3 Background

Local Partner agencies in Santa Clara County have until now primarily conducted threatened and endangered species permitting for urban growth, infrastructure development, and operations and maintenance activities with the Wildlife Agencies on a project-by-project basis<sup>3</sup>. In 2001, a USFWS Section 7 biological opinion (U.S. Fish and Wildlife Service 2001) recommended that a regional HCP for all or most of Santa Clara County be developed as a condition for approval of several development and road construction activities; these are listed below.

- U.S. Highway (U.S.) 101 widening (San José to Morgan Hill).
- Bailey Avenue Extension/U.S. 101 interchange.
- U.S. 85/101 South interchange.
- Coyote Valley Research Park.

An HCP was recommended so that local agencies could offset the cumulative and indirect effects of large-scale development and infrastructure projects on federally listed species. Similar recommendations have been made for other northern California counties (e.g., Contra Costa, Solano, Yolo, Sacramento, Yuba, Sutter, and Placer) for their large-scale water and transportation infrastructure projects.

In response to this recommendation, the County, the City of San José, VTA, and SCVWD entered into discussions that led to the signing of a memorandum of understanding (MOU) in June 2004 (City of San José et al. 2004). This MOU stated the signatories' agreement to develop a joint HCP/NCCP and to share in its funding. The MOU also stated that this HCP/NCCP would be a multi-species, multi-habitat plan that would establish a regional reserve system and would address and satisfy immediate and future regulatory compliance needs of the signatories. The regional reserve system would focus on acquisition, preservation, restoration, monitoring, and management of habitat used by the covered species identified in the Plan. Soon after the MOU was signed, these local agencies entered negotiations with CDFG to develop a Planning Agreement, a requirement of the NCCP Act.

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<sup>3</sup> An important exception is the SCVWD's Stream Maintenance Program permits, described in Chapter 2, Section 2.3.4.

Two new Local Partners, the Cities of Gilroy and Morgan Hill, joined the process in 2005.

All six Local Partners, USFWS, and CDFG signed a Planning Agreement on October 20, 2005 (County of Santa Clara et al. 2005). The purpose of this Planning Agreement was to lay the groundwork for development of an HCP/NCCP. Specifically, the Planning Agreement:

- Defined the signatories' goals and obligations with respect to development of the Plan.
- Created a preliminary description of the geographic scope, natural communities and species, and conservation objectives for the Plan.
- Ensured coordination between the Local Partners and Wildlife Agencies.
- Established concurrent planning for wetlands.
- Established a process for inclusion of scientific input and public participation.

The Planning Agreement defines the Plan as satisfying the requirements for an HCP under Section 10 of the ESA and an NCCP under the state NCCP Act.

The role of the Local Partners is to manage and fund development of the Plan for submission to the Wildlife Agencies. Pursuant to Section 10(a)(1)(B) of the ESA, once approved, the Plan and associated permit will authorize incidental take of federally listed species within the study area. The approved Plan will also serve as an NCCP and, once approved by CDFG, will enable CDFG to authorize take of covered species under Section 2835 of the California Fish and Game Code.

The Santa Clara Valley Open Space Authority (Open Space Authority) is expected to be a key partner during Plan implementation (see Chapter 8).

## 1.2 Scope of the Habitat Plan

This section introduces key elements of the Habitat Plan: covered activities, geographic scope, permit term, and covered species.

### 1.2.1 Covered Activities

A primary goal of this Plan is to protect species and their habitats in order to obtain authorization for incidental take of covered species under the ESA and the NCCP Act for certain types of activities in specific areas of Santa Clara County, in accordance with approved land use plans. *Covered activities* are those projects or ongoing activities that will receive incidental take authorization by the ESA and NCCP permits. Covered activities in the Plan fall into seven general categories.

- Urban development.
- In-stream capital projects.
- In-stream operations and maintenance.
- Rural capital projects outside streams.
- Rural development.
- Rural operation and maintenance of public infrastructure outside streams.
- Conservation strategy implementation (i.e., activities within the lands managed, enhanced, restored, and monitored to conserve the natural resources targeted by this Plan).

For details on the covered activities and the criteria used to select them, see Chapter 2 *Land Use and Covered Activities*.

## 1.2.2 Geographic Scope

The Local Partners began the planning process by defining a broad area—the *study area*—in which all planning would occur for the Plan.

### Study Area

The study area lies within Santa Clara County (**Figures 1-1 and 1-2**)<sup>4</sup>. Santa Clara County has a land area of 835,449 acres; the study area encompasses 519,506 acres, or approximately 62% of the county. The study area was defined as the area in which all covered activities would occur, impacts would be evaluated, and conservation activities would be implemented. The boundary of the study area was based on political, ecological, and hydrologic factors. The study area includes all of the Llagas/Uvas/Pajaro watersheds within Santa Clara County and all of the Coyote Creek watershed except for the Baylands. A large portion of the Guadalupe watershed is also within the study area. The study area also encompasses small areas outside these watersheds, as described below.

The northern edge of the study area is defined by the boundary of Alameda and Santa Clara Counties, excluding the Milpitas City Limits<sup>5</sup> and lands to the north owned by the San Francisco Public Utilities Commission (SFPUC). The SFPUC is preparing an HCP for lands in their Alameda watershed that includes approximately 10,000 acres in Santa Clara County.

<sup>4</sup> As discussed below, California State Parks (State Parks) lands are excluded from the permit area. Because of this exclusion, all of the land cover-related analyses in the Plan are based on the study area less State Parks lands unless otherwise noted. The size of the study area less State Parks lands is 460,205 acres.

<sup>5</sup> For convenience, all of Ed R. Levin County Park is included in the study area, even though a portion of this park is in Milpitas.

Lands in Joseph D. Grant County Park and Mount Madonna County Park outside the Coyote Creek and Llagas/Uvas/Pajaro watersheds are included in the study area, marking the eastern and southwestern boundaries of the study area, respectively. This inclusion allows full coverage of activities in these County parks under the Plan.

Tulare Hill, the Santa Teresa Hills, and the Calero Reservoir area, all within the Guadalupe River watershed, are included in the study area to ensure inclusion of serpentine soils and all occupied and potential habitat for Bay checkerspot butterfly, one of the primary covered species for this Plan.

Almaden Quicksilver County Park is in the study area to ensure inclusion of additional serpentine habitat, which supports a disproportionately high number of covered species, particularly covered plants.

Lands along Los Gatos Creek upstream through Vasona County Park owned by SCVWD and the County of Santa Clara Parks and Recreation Department (County Parks) (County of Santa Clara, Parks and Recreation Department 2003) are included in the study area to allow additional coverage of activities by these agencies.

Almost the entire City of San José lies within the study area. The Baylands and Alviso within San José are not within the study area to exclude current and historic tidally influenced areas. This line was drawn with reference to December 2005 color aerial photographs, historic maps of tidal areas (San Francisco Estuary Institute 2006), and data from the Baylands Ecosystem Goals Project (Goals Project 1999). Within San José, the northern boundary of the study area is the northern edge of the “bufferlands” of the Water Pollution Control Plant facility on Zanker Road.

San José’s Baylands were excluded from the study area to avoid covering species restricted to salt marshes and other saline habitats, which would significantly complicate the Plan. Other substantial planning efforts are underway in the Baylands of Santa Clara County (e.g., South Bay Salt Ponds Restoration Project); this area was excluded to avoid duplicating those efforts. In addition, no impacts are expected to occur to the unique Baylands species from covered activities.

## **Expanded Study Area for Burrowing Owl Conservation**

During Plan development, it became necessary to include conservation actions immediately outside of the study area in order to adequately mitigate and contribute to the recovery of western burrowing owl, one of the covered species. As described in Chapter 5 and in the species account (**Appendix D**), the population of western burrowing owl is declining in the study area. Conservation opportunities in the study area to increase the local population are very limited. After extensive discussions with the Wildlife Agencies and species experts, it became clear that the only way to increase the local population was to provide conservation outside the study area.

To address this need, an *expanded study area for burrowing owl conservation* (expanded study area) was identified in the northern edge of the county in portions of the cities of San José, Santa Clara, Mountain View, Milpitas, and Sunnyvale; in Fremont in Alameda County; and a small portion of San Mateo County (**Figure 1-2**). The expanded study area for burrowing owl conservation that falls outside of the primary Habitat Plan study area is 48,464 acres.

The allowable covered activities in this expanded study area are limited only to conservation actions for western burrowing owl. Coverage for these activities is provided only for this species. Projects and activities of the other jurisdictions, which are not Permittees, are not covered.

## Permit Area

The *permit area* is the area in which the Permittees are requesting take authorization from USFWS and CDFG for activities and projects covered by this Plan. The permit area constitutes those lands within the study area and expanded study area for burrowing owl conservation on which covered activities occur (see Chapter 2 for a description of covered activities). The permit area is the same as the study area except that it excludes Henry W. Coe State Park (**Figure 1-2**). This park was excluded from the permit area because activities within this park are not covered by the Habitat Plan and because it represents such a large portion of the study area. The small portion of Pacheco State Park within the study area is also excluded from the permit area. The permit area is 508,669 acres (519,506 acres in the study area + 48,464 in the expended study area - 58,642 acres of Henry W. Coe State Park within the study area<sup>6</sup> - 659 acres of Pacheco State Park within the study area).

The permit area also includes small, unmapped areas. Land management and monitoring activities may occur outside the mapped study area where a conservation parcel straddles the mapped permit area as long as more than half of each parcel is contained within the permit area. These unmapped areas will not exceed a total of 250 acres<sup>7</sup>.

### 1.2.3 Permit Term

The permit term is the time period in which all covered activities can receive take authorization under the Plan, consistent with the requirements of the Plan. The permit term is also the time in which all conservation actions must be successfully completed to offset the impacts of the covered activities.

<sup>6</sup> The total size of the park is 85,843 acres, of which 27,201 acres occurs outside the study area in Santa Clara and Stanislaus Counties.

<sup>7</sup> Because of their uncertain location and lack of data, the unmapped areas are not included in the total study area or permit area acreage or any calculations of land cover type.

The Local Partners are seeking permits from the Wildlife Agencies with terms of 50 years. Each Permittee will request a permit from each of the two Wildlife Agencies. If approved, each Local Partner would receive a permit from each agency. These permits will be tied to this Plan and to the Implementing Agreement (**Appendix B**). Each permit will be issued to all Permittees collectively. Prior to permit expiration, the Permittees may apply to renew or amend the Plan and its associated permits and authorizations to extend their terms. The permit term of 50 years was selected because it allows for the full and successful implementation of the covered activities (Chapter 2), the conservation strategy (Chapter 5), the monitoring and adaptive management program (Chapter 7), and the funding strategy (Chapter 9). Each of these components is discussed below.

## Time to Implement Covered Activities

A summary of major local planning documents and their respective time horizons is provided in **Table 1-1**. These planning documents have durations between 10 and 50 years, reflecting the time it takes to secure funding and permits and construct the projects identified in the plans. The largest source of covered activities is the urban growth of the three participating cities consistent with their general plans<sup>8</sup> (City of San José 2011; City of Gilroy 2002; City of Morgan Hill 2001) and rural oriented growth in unincorporated Santa Clara County. The Morgan Hill and San José general plans have ultimate build out lines<sup>9</sup> that are assumed to be developed with urban uses by the end of the 50-year permit term and not expand in future General Plan updates. The City of San José General Plan assumes eventual urban development in the Almaden Valley Urban Reserve and Coyote Valley Urban Reserve. Specific plans must first be developed and adopted for each area. The City of Gilroy General Plan addresses growth from 2002 through 2020. If a future Gilroy General Plan update expands the City's urban area, impacts of that expansion to covered species will have to be addressed at that time. Growth in the rural areas of the county is much less constrained geographically than in the cities so it is expected to occur, at a fairly even pace throughout the 50-year permit term, based on trends over the past ten years.

The planning horizon for capital projects is even longer than that of urban development within cities. Timelines for SCVWD's capital projects often extend for decades, so this agency requires a permit term that encompasses the planning horizons of as many of these projects as is feasible. Other covered projects (see Chapter 2) may take several decades to receive the funding needed to implement them (Santa Clara Valley Water District 2000, 2002a, 2002b, 2005a, 2005b). Many public infrastructure projects have a lifespan of 50–100 years. Because much of the public infrastructure in the study area was constructed in the 1940s through the 1960s, local engineers expect most of this infrastructure to need

<sup>8</sup> Any development proposed in future General Plan updates that goes beyond that described in Chapter 2 would not be covered by this Plan; see Chapter 10 for Plan amendment procedures.

<sup>9</sup> Urban Limit Line for Morgan Hill and Greenline for San José.



replacement or major repair in the next 50 years (e.g., all County-maintained bridges are expected to need replacement or major repairs in the next 50 years).

Some covered projects are not expected to be implemented until later in the 50-year permit term. Such projects include the many bridge replacement projects, several flood control and water supply projects, and several road widening projects. A longer permit term is necessary to anticipate and adequately mitigate the impacts of these projects on the covered species.

Ongoing maintenance activities of SCVWD, the County, and participating cities are expected to continue in perpetuity; consequently, take authorization for these activities is needed for as long a period as feasible. As described in Chapter 4, these on-going covered activities are expected to affect the covered species throughout the 50-year permit term. For example, road maintenance performed by the County occurs annually. Maintenance on rural roads is expected to affect habitat for many covered species, including California red-legged frog, California tiger salamander, western burrowing owl, Metcalf canyon jewelflower, most beautiful jewelflower, and Mount Hamilton thistle. Many of these species occur on roadcuts or immediately adjacent to roads in drainages. Similarly, ongoing maintenance by SCVWD covered in this Plan (see Chapter 2) is expected to affect covered species for the duration of the permit term. For example, maintenance of canals has the potential to affect California red-legged frog, western pond turtle, and serpentine plants.

## **Time to Implement, Monitor, and Adjust Conservation Actions**

The length of the permit term also provides adequate time for the assembly of a reserve system and development of a management program on reserve lands. Land will only be acquired from willing sellers. Landowners may not be willing to sell at a reasonable price for many years after the permits are issued. A 50-year permit term provides adequate time for willing landowners to become available and for the land agents of the Plan to negotiate a fair price for the land in fee title or conservation easement (see Chapter 5 for a description of the land acquisition requirements of the Plan and Chapter 8 for a description of the land acquisition process). It may take several years to complete a single land acquisition or purchase a conservation easement. Because 100–200 such transactions will be required to assemble the reserve system, adequate time is needed to ensure this can happen before the end of the permit term. A permit term of 50 years also allows the monitoring and adaptive management programs to become well established so that they will continue in perpetuity successfully. As described in Chapter 7, the monitoring and adaptive management program will go through three distinct phases: data inventory, targeted studies, and long-term monitoring. Each phase will take many years to complete successfully<sup>10</sup>.

<sup>10</sup> Many regional HCPs and NCCPs approved in southern California over 10 years ago are still developing their monitoring programs, demonstrating that it takes decades to develop and implement a successful monitoring program on such a large scale.

One type of monitoring, called “status and trend monitoring”, will track long-term trajectories of species populations and other physical and biological conditions in the study area. A permit term of 50 years will provide adequate time to collect enough trend data for all of the covered species; if management responses are necessary, the permit term will also allow sufficient time to adjust management. Monitoring the success of restoration actions (described in Chapter 5) is expected to take 5–10 years for each restoration project. Most restoration actions cannot be initiated until land is acquired for the reserve system. A permit term of 50 years is necessary to allow enough time to complete land acquisition with at least 5–10 years remaining on the permit in which to successfully initiate or complete (and possibly remediate if necessary) all restoration actions. The Permittees have committed to acquiring all land for the Plan by Year 45 and initiating all restoration projects by Year 40 (see Chapter 5 for details). Therefore, a 50-year permit term is necessary to complete these actions and to leave sufficient time for monitoring before the permit term ends.

A successful program for management, monitoring, and adaptive management is essential to the success of the reserve system after the permit term. The Permittees will be obligated during the permit term to address changes in circumstances foreseen by the Plan (see Chapter 10) and to remediate the conservation areas affected by these changes. A longer permit term is more likely to encompass a changed circumstance that will require a remedial action.

## Time to Secure Adequate Funding

A 50-year permit term allows sufficient time to generate the necessary funding for Plan implementation. As described in Chapter 9, the Plan will be funded by a wide variety of local, state, and federal sources. Some of these sources will not be available for 10–30 years or more. To take advantage of these funding sources, therefore, the permit term must be at least 40 years.

Funding is also needed during the permit term to generate the necessary funds for management and monitoring after the permit expires (e.g., an endowment). In Chapter 9, the Plan describes how this will be accomplished and by when. The permit term must therefore allow sufficient time to accumulate the long-term funding.

## Conclusions

Based on the implementation horizon for covered projects, the ongoing regulatory requirement of operation and maintenance activities, the need to acquire lands and develop a successful reserve system, and the need for adequate funding, the Local Partners have determined that a 50-year permit term will best address regulatory and biological considerations. In summary, the 50-year permit term provides sufficient time to accomplish the following critical elements of the Plan.

- Fully implement the current general plans of the cities and the County.

- Fully implement the Permittees' capital projects that are covered by the Plan.
- Implement the Permittees' ongoing activities as long as is feasible.
- Allow sufficient time to assemble the Plan reserve system from willing sellers and partnerships with local agencies and private landowners.
- Secure all necessary funding for Plan implementation during the permit term and secure funds during the permit term to generate funding for the Plan in perpetuity.
- Develop an effective adaptive management program that will be implemented in perpetuity, given the current uncertainties in knowledge about the ecology of covered species and responses to resource management.
- Provide sufficient incentive for the Local Partners to commit the substantial resources necessary to complete the Habitat Plan (i.e., the permit term covers enough projects and activities to make the large up-front investment in the Habitat Plan cost effective).

Take authorization for all covered activities, including covered operations and maintenance activities, will expire at the end of the permit term, unless the permit is renewed or replaced. Near the end of the permit term, the Permittees will determine whether to extend the term of the permit through the formal amendment process described in Chapter 10.

## 1.2.4 Covered Species

As required by the NCCP Act, this Plan will protect native biological diversity, habitat for native species, natural communities, and local ecosystems. This broad scope will conserve a wide range of natural resources including native species that are common or rare. However, the permits issued by the Wildlife Agencies will name specific species that are either currently listed as threatened or endangered or that may become listed during the permit term.

This Plan addresses 18 listed and nonlisted species (**Table 1-2**): nine wildlife species and nine plant species. These covered species are expected to be named on the ESA and NCCP Act permits. In exchange, the Plan will provide long-term conservation and management of these species. The 18 covered species were identified on the basis of an initial assessment of the effect of covered activities and conservation measures on 148 species that are listed or that could become listed during the permit term in the study area.

The Plan includes conservation measures to protect all 18 covered species, whether or not they are currently listed. Accordingly, any nonlisted species addressed by the Plan's conservation strategy will not require additional conservation within the study area should that species become listed during the permit term. See *Regulatory Setting* below for a discussion of why plants are included as covered species.

During Plan development, coverage for fish species was sought from the National Marine Fisheries Service (NMFS) and CDFG for south central California coast steelhead (*Oncorhynchus mykiss*), central California coast steelhead (*Oncorhynchus mykiss*), and Central Valley fall-run Chinook salmon (*Oncorhynchus tshawytscha*). Coverage was also sought from USFWS and CDFG for Pacific lamprey (*Lampetra tridentata*). To provide this coverage, the Permittees worked closely with these agencies to develop an aquatic conservation strategy for these fish that would meet their regulatory standards. A draft aquatic conservation strategy for the covered fish was included in the second administrative draft Habitat Plan released in June 2009. However, after extensive discussions, it was determined that coverage for fish species should be obtained through a separate process in order to allow the Plan to be completed within the desired timeframe. Thus, south central California coast steelhead, central California coast steelhead, Central Valley fall-run Chinook salmon, and Pacific lamprey are not covered by the Habitat Plan. Coverage for these species in the Guadalupe River and Coyote Creek watersheds will be provided, in part, by the Three Creeks HCP being prepared by SCVWD (see Chapter 2 for a discussion of this HCP). Coverage for these species in the Pajaro River watershed will need to be provided through a separate conservation plan or an amendment to this Habitat Plan (see Chapter 10 for the amendment process). NMFS, USFWS, and CDFG have committed to supporting the Local Partners in the development and eventual permitting of this separate strategy.

## Species Evaluation

To determine which species would be covered by the Plan, a comprehensive list of 148 special-status species that occur or may occur in the study area was compiled (**Appendix C**). This list was developed by reviewing the following sources.

- California Natural Diversity Database (CNDDB) (2008).
- California Native Plant Society (CNPS) (2007) *Inventory of Rare and Endangered Vascular Plants of California*.
- CDFG lists of Special Animals and Special Plants (California Department of Fish and Game 2003, 2006, 2007).
- An animal species list obtained from the USFWS website for Santa Clara County (U.S. Fish and Wildlife Service 2006).
- Personal communication with local experts including Wildlife Agency staff; SCVWD biologists; representatives of local environmental groups including CNPS Santa Clara Valley Chapter, Santa Clara Valley Chapter of the Audubon Society, and Streams for Tomorrow; and members of the Habitat Plan Science Advisors.

## Definition of Special-Status Species

*Special-status species* are defined as plants and animals that are legally protected under ESA, CESA, or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing.

Special-status plants are species with one or more of the following characteristics.

- Listed or proposed for listing as threatened or endangered under ESA (50 Code of Federal Regulations [CFR] 17.12 [listed plants] and various notices in the Federal Register [FR] [proposed species]).
- Candidates for possible future listing as threatened or endangered under the ESA (70 FR 24870–24934, May 11, 2005).
- Listed or candidates for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations [CCR] 670.5).
- Listed as rare under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.).
- Determined to meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380).
- Considered by CNPS to be “rare, threatened or endangered in California” (Lists 1B and 2 in California Native Plant Society 2007) or vascular plants, bryophytes, and lichens listed as having special status by CDFG (California Department of Fish and Game 2007).
- Listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution (Lists 3 and 4 in California Native Plant Society 2007) that may be included on the basis of local significance or recent biological information.

Special-status animals are species with one or more of the following characteristics.

- Listed or proposed for listing as threatened or endangered under the ESA (50 CFR 17.11 [listed animals] and various notices in the FR [proposed species]).
- Candidates for possible future listing as threatened or endangered under the ESA (70 FR 24870–24934, May 11, 2005).
- Determined to meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380).
- Listed or candidates for listing by the State of California as threatened or endangered under CESA (14 CCR 670.5).
- Wildlife species of special concern to CDFG (California Department of Fish and Game 2003).

- Fully protected species under the California Fish and Game Code Section 3511(birds), Section 4700 (mammals), Section 5515 (fish), and Section 5050 (reptiles and amphibians).
- Species with no formal special status but thought by experts to be rare or in serious decline and to warrant special status based on recent information.

## Covered Species Criteria

For each special-status species with potential to occur in the study area (**Appendix C**), information was gathered on its status, population trends, distribution, threats, conservation, and management efforts. The following criteria were then applied to each species to determine whether it would be covered (i.e., included in the final permits). To be covered, a species had to meet all four of the following criteria.

### Range

The species is known to occur or is likely to occur within the Plan study area, based on credible evidence, or the species is not currently known in the study area but is expected to occur in the study area during the permit term (e.g., through range expansion or reintroduction to historic range).

### Status

The species meets at least one of the following statutory criteria.

- Listed under the ESA as threatened or endangered, or proposed for listing.
- Listed under CESA as threatened or endangered or a candidate for such listing.
- Listed under the Native Plant Protection Act as rare.
- Expected to be listed under ESA or CESA within the permit term (assumed to be 50 years). Potential for listing during the permit term is based on current listing status, consultation with experts and Wildlife Agency staff, evaluation of species population trends and threats, and best professional judgment of the biologists working on the Plan.

### Impact

The species or its habitat would be adversely affected by covered activities or projects that may result in take of the species.

## Data

Sufficient data on the species' life history, habitat requirements, and occurrence in the study area are available to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to levels specified by regulatory standards.

Species proposed for coverage in the Plan were limited to those species for which impacts from covered activities were likely. However, it is important to note that many other special-status species and common species are expected to benefit from the conservation strategy of this Plan, as described in Chapter 5.

### 1.2.5 Relationship to the Proposed Three Creeks Habitat Conservation Plan

SCVWD is developing the Three Creeks Habitat Conservation Plan (Three Creeks HCP) to protect and enhance habitats for a suite of aquatic species and provide conservation for species impacted by SCVWD's on-going water supply operations in the northern Santa Clara Valley.

The geographic area of the proposed Three Creeks HCP includes the following.

- Coyote Watershed in the eastern portion of the County. Sixteen major creeks drain this 322-square-mile area. The county's largest watershed, it extends from the urbanized valley floor upward to the natural areas of the Mt. Hamilton range. Coyote Creek, its main waterway, is the longest creek in the county.
- Guadalupe Watershed in the east-central part of the County. This 170-square-mile area drains to the Guadalupe River and its tributaries through downtown San José. SCVWD has facilities on four major tributaries: Calero Creek, Alamitos Creek, Guadalupe Creek, and Los Gatos Creek. The Guadalupe River Watershed drains both the Mt. Hamilton Range and the Santa Cruz Mountains Range (Los Gatos Creek).
- Stevens Creek Watershed in the southwest portion of the County. This watershed is part of the Lower Peninsula Watershed, a 98-square-mile area whose many small-creek watersheds feed the tidal wetlands along the San Francisco Bay's southwest shoreline. Stevens Creek has one of the last remaining viable steelhead trout runs in the County.

The geographic area of the proposed Three Creeks HCP partially overlaps with the Habitat Plan study area. The Three Creeks HCP includes the Stevens Creek, Guadalupe, and Coyote watersheds but does not include the Pajaro/Uvas/Llagas watersheds. The Plan study area does not include the Stevens Creek watershed and the Los Gatos Creek portion of the Guadalupe watershed. See **Figure 1-3** for a map of the Three Creeks HCP program area in relation to the Habitat Plan study area.

The proposed Three Creeks HCP covers implementation of capital projects and operations and maintenance activities within its study area related to water supply. The Three Creeks HCP is a standalone document; however, the activities described in Chapter 2 of this Plan that occur in the Three Creeks HCP study area (Guadalupe Creek, Alamitos Creek, Calero Creek, the Guadalupe River, Coyote Creek, and Penitencia Creek) are covered activities under both the Three Creeks HCP and the Habitat Plan. Covered activities described in this Plan that occur in the Uvas/Llagas watersheds are only covered by this Plan. Three Creeks HCP activities within Los Gatos Creek will be covered by this Plan at and below Vasona Lake. The Habitat Plan does not include Stevens Creek or Los Gatos Creek above Vasona Lake.

In addition to the water supply activities, the proposed Three Creeks HCP contains a Conservation Program targeted at the conservation of listed fish species. Some of the conservation actions described in the Three Creeks HCP may have adverse affects on semi-aquatic species covered by this Plan, including the California tiger salamander, California red-legged frog, and western pond turtle. Therefore, this Plan covers the activities described in the Three Creeks HCP Conservation Program for potential impacts to species covered by this Plan. The Three Creeks HCP Conservation Plan is described in Chapter 2.

Under the proposed Three Creeks HCP, SCVWD will request incidental take permits from USFWS and CDFG (through a Fish and Game Code Section 2080.1 concurrence finding or a 2081 incidental take permit) for the species and geographic areas unique to the Three Creeks HCP.

## 1.3 Regulatory Setting

The Plan is designed primarily to comply with the ESA, CESA, and the NCCP Act. The Plan is also consistent with other federal and state wildlife and related laws and regulations, listed here and described in greater detail below.

- Migratory Bird Treaty Act.
- Bald Eagle and Golden Eagle Protection Act.
- California Fish and Game Code Sections 3511, 4700, 5050, 5515 (fully protected species).
- California Fish and Game Code Section 3503 (bird nests).
- California Fish and Game Code Section 3503.5 (birds of prey).
- National Environmental Policy Act of 1969.
- California Environmental Quality Act of 1970.
- Clean Water Act of 1972 Sections 401 and 404.
- Porter-Cologne Water Quality Control Act.
- California Fish and Game Code Sections 1600–1616 (Lake or Streambed Alteration Agreement).
- National Historic Preservation Act.



## 1.3.1 Federal and State Endangered Species Laws

### Federal Endangered Species Act

USFWS and NMFS administer the ESA. ESA requires USFWS and NMFS to maintain lists of threatened and endangered species and affords substantial protection to listed species. NMFS's jurisdiction under ESA is limited to the protection of marine mammals, marine fishes, and anadromous fishes<sup>11</sup>; all other species are subject to USFWS jurisdiction.

USFWS and NMFS can list species as either *endangered* or *threatened*. An *endangered* species is at risk of extinction throughout all or a significant portion of its range (ESA Section 3[6]). A *threatened* species is likely to become endangered within the foreseeable future (ESA Section 3[19]). Section 9 of the ESA prohibits the take of any fish or wildlife species listed under ESA as endangered or threatened<sup>12</sup>. *Take*, as defined by ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” *Harm* is defined as “any act that kills or injures the species, including significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering” (50 CFR 17.3). Section 9 prohibits the “removal or reduction to possession” of any listed plant species “under federal jurisdiction” (i.e., on federal land, where federal funding is provided, or where federal authorization is required). Even though under ESA there is no prohibition for take of plants on nonfederal lands, this Plan includes many covered plants. Some plants are covered in order to meet regulatory obligations under ESA Section 7 and to comply with CESA. Incidental take authorization is also requested for plants to provide no-surprises assurances for these species (see Chapter 10 *Assurances*).

The ESA includes mechanisms that provide exceptions to the Section 9 take prohibitions. These are addressed in Section 7 for federal actions and Section 10 for nonfederal actions.

### Section 7

Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure that its actions do not result in

<sup>11</sup> *Anadromous fishes* are fish that spend part of their life cycle in the ocean and part in fresh water. NMFS has jurisdiction over anadromous fish that spend the majority of their life cycle in the ocean.

<sup>12</sup> The protection of threatened species under Section 9 is discretionary through a rule issued under Section 4(d) of the ESA. Until a “4(d) rule” is issued by NMFS, threatened anadromous fish or marine species are not protected by the ESA. By regulation, the USFWS automatically affords Section 9 protections to threatened species at the time of listing. These protections can later be modified by USFWS through a 4(d) rule.

jeopardy to listed species or in the adverse modification of critical habitat<sup>13</sup>, each federal agency must consult with USFWS or NMFS—or both—regarding federal agency actions that may affect listed species. The issuance of permits for this Plan is a federal action that triggers a Section 7 consultation. Consultation begins when the federal agency submits a written request for initiation to USFWS or NMFS, along with the agency’s biological assessment of its proposed action, and when USFWS or NMFS accepts that biological assessment as complete. If USFWS or NMFS concludes that the action is not likely to adversely affect a listed species, the action may be conducted without further review under ESA. Otherwise, USFWS or NMFS must prepare a written biological opinion describing how the agency’s action will affect the listed species and its critical habitat. For this Plan, the USFWS will consult internally (with itself) to comply with Section 7 of the ESA.

If the biological opinion concludes that the proposed action would jeopardize the continued existence of a listed species or adversely modify its critical habitat, the opinion will suggest “reasonable and prudent alternatives” that would avoid that result. If the biological opinion concludes that the proposed action would take a listed species but would not jeopardize its continued existence, the biological opinion will include an *incidental take statement*. *Incidental take* is take that is “incidental to, and not intended as part of, an otherwise lawful activity” (64 CFR 60728). The incidental take statement specifies an amount of take that is allowed to occur as a result of the action and may require reasonable and prudent measures to minimize the impact of the take.

Any project with a federal lead agency or federal involvement (e.g., a federal permit, federal funding, or a project on federal land) must obtain their take authorization through Section 7 rather than Section 10 and an HCP. This means that projects with federal involvement cannot directly utilize an approved HCP for their take authorization. However, if the applicant complies with the conservation measures in this Plan, the Section 7 consultation process is expected to be greatly streamlined. Therefore, the covered activities described in Chapter 2 include projects or activities that may need to obtain their take authorization through Section 7. Unless otherwise required by law or regulation, USFWS will ensure that a biological opinion for a project with a federal lead agency that is addressed by the Plan is consistent with the biological opinion for the Habitat Plan. USFWS will not impose measures on applicants for coverage under the Plan in excess of those that have been or will be required by the Implementing Agreement<sup>14</sup>, the Plan, and the permits, unless otherwise required by law or regulation. Federal agencies cannot receive the regulatory assurances available under Section 10 of the ESA.

<sup>13</sup> *Critical habitat* is defined as specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the Federal Register.

<sup>14</sup> The Implementing Agreement is a legal document, signed by all parties, that identifies roles and responsibilities of all parties, including the Permittees and the Wildlife Agencies. The agreement typically incorporates actions from the conservation plan that are agreed to by all parties. See Appendix B for the Implementing Agreement for this Plan.

## Section 10

Until 1982, state, local, and private entities had no means to acquire incidental take authorization as could federal agencies under Section 7. Private landowners and local and state agencies risked direct violation of the ESA no matter how carefully their projects were implemented. This statutory dilemma led Congress to amend Section 10 of the ESA in 1982 to authorize the issuance of an incidental take permit to nonfederal project proponents upon completion of an approved conservation plan. The term *conservation plan* has evolved into *habitat conservation plan*.

In cases where federal land, funding, or authorization is not required for an action by a nonfederal entity, the take of listed fish and wildlife species can be permitted by USFWS and/or NMFS through the Section 10 process. Private landowners, corporations, state agencies, local agencies, and other nonfederal entities must obtain a Section 10(a)(1)(B) *incidental take permit* for take of federally listed fish and wildlife species “that is incidental to, but not the purpose of, otherwise lawful activities.”

The take prohibition for listed plants is more limited than for listed fish and wildlife. Under Section 9(a)(2)(B) of the ESA, endangered plants are protected from “removal, reduction to possession, and malicious damage or destruction” in areas that are under federal jurisdiction. Section 9(a)(2)(B) of the ESA also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in violation of any state law or regulation or in violation of a state criminal trespass law. Thus, the ESA does not prohibit the incidental take of federally listed plants on private or other nonfederal lands unless the action requires federal authorization or is in violation of state law. Thus, Section 10 incidental take permits are only required for wildlife and fish species. However, the Section 7(a)(2) prohibition against jeopardy applies to plants, and issuance of a Section 10(a)(1)(B) incidental take permit cannot result in jeopardy to a listed plant species.

The HCP must specify the following mandatory elements.

- The impact that will likely result from the taking of covered species.
- The steps the applicant will take to monitor, minimize, and mitigate such impacts to the maximum extent practicable.
- The funding that will be available to implement such steps.
- The procedures to be used to deal with unforeseen circumstances<sup>15</sup>.
- The alternative actions to such taking the applicant considered and the reasons why such alternatives are not proposed to be utilized.

<sup>15</sup> *Unforeseen circumstances* are changes in circumstances affecting a covered species or geographic area covered by the HCP that could not reasonably have been anticipated by the plan developers, and that result in a substantial and adverse change in the status of a covered species.

- Such other measures that the Director [of the Department of Interior or Commerce] may require as being necessary or appropriate for purposes of the plan (50 CFR 17.22(b)).

The Santa Clara Valley Habitat Plan is intended to satisfy these requirements.

To receive an incidental take permit, Section 10(a)(2)(B) of the ESA requires that the following criteria be met.

- The taking will be incidental to otherwise lawful activities.
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.
- The applicant will ensure adequate funding for the HCP and procedures to deal with unforeseen circumstances.
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild.
- The applicant will ensure that other measures that the Services [USFWS and NMFS] may require as being necessary or appropriate will be provided.
- The Services have received such other assurances as may be required that the HCP will be implemented.

Prior to the approval of an HCP, USFWS is required to undertake an internal Section 7 consultation<sup>16</sup> because issuance of an incidental take permit is a federal action. (See the discussion of ESA Section 7, above.) Elements specific to the Section 7 process that are not required under the Section 10 process (e.g., analysis of impacts on designated critical habitat, analysis of impacts on listed plant species, and analysis of indirect and cumulative impacts on listed species) are included in this Plan to meet the requirements of Section 7.

## California Endangered Species Act

CESA prohibits take of wildlife and plants listed as threatened or endangered by the California Fish and Game Commission. *Take* is defined under the California Fish and Game Code (more narrowly than under ESA) as any action or attempt to “hunt, pursue, catch, capture, or kill.” Therefore, take under CESA does not include “the taking of habitat alone or the impacts of the taking”<sup>17</sup>. Rather, the courts have affirmed that under CESA, “taking involves mortality.”

Like ESA, CESA allows exceptions to the prohibition for take that occurs during otherwise lawful activities. The requirements of an application for incidental take under CESA are described in Section 2081 of the California Fish and Game Code. Incidental take of state-listed species may be authorized if an applicant submits an approved plan that minimizes and “fully mitigates” the impacts of this take.

<sup>16</sup> When USFWS issues a permit, they will consult with itself and NMFS, if necessary.

<sup>17</sup> *Environmental Council of Sacramento v. City of Sacramento*, 142 Cal. App. 4th 1018 (2006).

## Natural Community Conservation Planning Act

In 1991, California's NCCP Act (California Fish and Game Code, Section 2800 et seq.) was enacted to implement broad-based planning that balances appropriate development and growth with conservation of wildlife and habitat. Pursuant to the NCCP Act, local, state, and federal agencies are encouraged to prepare NCCPs to provide comprehensive management and conservation of multiple species and their habitats under a single plan, rather than through preparation of numerous individual plans on a project-by-project basis. The NCCP Act is broader in its orientation and objectives than are ESA and CESA, and preparation of an NCCP is voluntary. The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land use. To be approved by CDFG, an NCCP must provide for the conservation of species and protection and management of natural communities in perpetuity within the area covered by permits. *Conservation* is defined by the NCCP Act and the California Fish and Game Code as actions that result in the delisting of state-listed species. Thus, NCCPs must contribute to the recovery of listed species or prevent the listing of nonlisted species rather than just mitigate the effects of covered activities. This recovery standard is one of the major differences between an NCCP and an HCP prepared to satisfy ESA or CESA.

The 1991 NCCP Act was replaced with a substantially revised and expanded NCCP Act in 2002. The revised NCCP Act established new standards and guidance on many facets of the program, including scientific information, public participation, biological goals, interim project review, and approval criteria. The new NCCP Act took effect on January 1, 2003. To approve an NCCP under the new NCCP Act, CDFG must make a series of findings.

- The Plan must be consistent with the Planning Agreement.
- The Plan must provide for the conservation and management of the covered species (*conservation* is defined to mean that the Plan must contribute to species recovery).
- The Plan must protect habitat, natural communities, and species diversity on the landscape level (definitions of these and other NCCP terms are provided in Chapter 3 and **Appendix A**).
- The Plan must conserve the ecological integrity of large habitat blocks, ecosystem function, and biodiversity.
- The Plan must support sustainable populations of covered species.
- The Plan must provide a range of environmental gradients and habitat diversity to support shifting species distributions.
- The Plan must sustain movement of species among reserves.
- Mitigation and conservation must be roughly proportional to impacts in timing and extent.
- Funding for conservation, monitoring, and adaptive management must be adequately assured.

The Santa Clara Valley Habitat Plan is intended to comply with the NCCP Act to conserve the covered species and ecosystems of a significant part of Santa Clara County and to provide authorization for take of covered species in accordance with Section 2835 of the California Fish and Game Code. **Table 1-3** provides a “checklist” of NCCP findings that CDFG must make to issue its NCCP permit along with the locations in the document where those findings are supported.

## 1.3.2 Other Federal and State Wildlife Laws and Regulations

### Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918, as amended (MBTA), implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful, as is taking of any parts, nests, or eggs of such birds (16 U.S. Government Code [USC] 703). *Take* is defined more narrowly under the MBTA than under ESA and includes only the death or injury of individuals of a migratory bird species or their eggs. As such, *take* under the MBTA does not include the concepts of harm and harassment as defined under ESA. The MBTA defines migratory birds broadly; all covered birds in this Plan are considered migratory birds under the MBTA.

USFWS provides guidance regarding take of federally listed migratory birds (Appendix 5 in the HCP Handbook [U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996]). According to these guidelines, an incidental take permit can function as a Special Purpose Permit under the MBTA (50 CFR 21.27) for the take of all ESA-listed covered species in the amount and/or number and subject to the terms and conditions specified in an HCP. Any such take will not be in violation of the MBTA (16 USC 703-12). The following covered species are protected by the MBTA.

- Western burrowing owl.
- Least Bell’s vireo.
- Tricolored blackbird.

Of these, only least Bell’s vireo is currently listed under ESA. Accordingly, once issued, the incidental take permit will automatically function as a Special Purpose Permit under the MBTA, as specified under 50 CFR Sec. 21.27, for least Bell’s vireo for a 3-year term subject to renewal by the Permittees. Should any other of the covered birds become listed under ESA during the permit term, the ESA permit would also constitute a Special Purpose Permit under the MBTA for that species for a 3-year term as specified under 50 CFR 21.27 subject to renewal by the Permittees.

Nonlisted covered species as well as other migratory birds not covered by the permit will benefit from seasonal restrictions on construction and other

conservation measures described in this Plan. The creation of the Reserve System and subsequent restoration and management will also be a significant “benefit to the migratory bird resource” as required by the Special Purpose Permit. Compliance with the conditions on covered activities described in Chapter 6 are consistent with the requirements of the MBTA for the covered migratory birds. It will be the responsibility of individual project applicants to fully comply with the MBTA for non-covered migratory birds.

## Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (Eagle Act) prohibits the taking or possession of and commerce in bald and golden eagles with limited exceptions. Under the Eagle Act, it is a violation to “take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or in any manner, any bald eagle commonly known as the American eagle, or golden eagle, alive or dead, or any part, nest, or egg, thereof.” *Take* is defined to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, and disturb. *Disturb* is further defined in 50 CFR Part 22.3 as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.”

Recent revisions to the Eagle Act authorizes take of bald eagles and golden eagles under the following conditions: (1) where the take is compatible with the preservation of the bald eagle and golden eagle, (2) is necessary to protect an interest in a particular locality, (3) is associated with but not the purpose of an otherwise lawful activity, and (4) for individual instances of take the take cannot be avoided, or (5) for programmatic take the take is unavoidable even though advanced conservation practices are being implemented (50 CFR 22.26). Permits issued under this regulation usually authorize disturbance only; however, in limited cases a permit may authorize lethal take that results from but is not the purpose of an otherwise lawful activity.

Bald and golden eagles are not covered species in this Plan.

## California Fully Protected Species

In the 1960s, before CESA was enacted, the California legislature identified specific species for protection under the California Fish and Game Code. These *fully protected* species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of bird species for the protection of livestock. Fully protected species are described in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code. These protections state that “...no provision of

this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected [bird], [mammal], [reptile or amphibian], [fish].” This Plan includes conservation measures to avoid taking fully protected species as defined by the California Fish and Game Code<sup>18</sup>. Fully protected species expected to occur in the study area include, but are not restricted to, those listed below.

- Golden eagle.
- American peregrine falcon.
- Southern bald eagle.
- White-tailed kite.
- California condor.
- Ring-tailed cat (= ringtail).

## California Fish and Game Code 3503 (Bird Nests)

Section 3503 of the California Fish and Game Code makes it “unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.” Therefore, CDFG may issue permits authorizing take. The Plan contains conservation measures to avoid and minimize such take to the maximum extent practicable in order to comply with Section 3503. However, some take to covered birds may still occur; the NCCP permit will serve as the authorization for take nests or eggs of covered birds pursuant to Section 3503.

## California Fish and Game Code 3503.5 (Birds of Prey)

Section 3503.5 of the California Fish and Game Code prohibits the take, possession, or destruction of any birds of prey or their nests or eggs “except as otherwise provided by this code or any regulation adopted pursuant thereto.” CDFG may issue permits authorizing take of birds of prey or their nests or eggs pursuant to CESA or the NCCP Act. The only bird of prey covered by the Plan is the western burrowing owl (**Table 1-2**). The Plan contains conservation measures to avoid and minimize take of western burrowing owl in order to comply with Section 3503.5. The NCCP permit will serve as the authorization for take of birds, eggs, or nests of western burrowing owl that cannot be avoided pursuant to Section 3503.5.

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<sup>18</sup> Recent legislation allows NCCPs to provide take authorization for fully protected species covered by an NCCP. Because no fully protected species is covered by this Plan, take of fully protected species must be avoided.



### 1.3.3 National Environmental Policy Act

NEPA requires federal agencies to include in their decision-making process appropriate and careful consideration of all environmental effects of a proposed action and of possible alternatives. Documentation of the environmental impact analysis and efforts to avoid or minimize the adverse effects of proposed actions must be made available for public notice and review. This analysis is documented in either an environmental assessment or an environmental impact statement (EIS). Project proponents must disclose in these documents whether their proposed action will adversely affect the human or natural environment. NEPA's requirements are primarily procedural rather than substantive in that NEPA requires disclosure of environmental effects and mitigation possibilities but includes no requirement to mitigate.

The issuance by USFWS of an incidental take permit under Section 10 of the ESA constitutes a federal action. Therefore, USFWS must comply with NEPA. To satisfy NEPA requirements, USFWS released a draft EIS in mid-December of 2010 for a 90-day comment period that closed in March 2011. The draft EIS accompanied the draft Habitat Plan.

### 1.3.4 California Environmental Quality Act

CEQA is similar to but more extensive than NEPA in that it requires that significant environmental impacts of proposed projects be reduced to a less-than-significant level through adoption of feasible avoidance, minimization, or mitigation measures unless overriding considerations are identified and documented that make the mitigation measures or alternatives infeasible. CEQA applies to certain activities in California undertaken by either a public agency or a private entity that must receive some discretionary approval from a California government agency. In issuing the NCCP Act permit, CDFG must comply with CEQA. Similarly, the action of the Local Partners in adopting the Plan is subject to CEQA compliance. The County of Santa Clara is serving as the lead agency under CEQA. To comply with CEQA, the Local Partners released a draft joint environmental impact statement/ environmental impact report (EIS/EIR) in mid-December of 2010. The public comment period on the draft EIS/EIR closed in March 2011. The draft EIS/EIR accompanied the draft Habitat Plan.

The final EIS/EIR prepared for the Habitat Plan is intended to provide programmatic compliance with CEQA for all activities covered by this Plan. Future projects that receive take coverage under the Plan must also comply with CEQA at the project level through their local jurisdiction. It is expected that the conservation provided in this Plan will be sufficient to meet all CEQA mitigation standards for impacts on the special-status species and natural communities that are covered in this Plan. However, because circumstances may change, full CEQA coverage through the EIS/EIR prepared for the Habitat Plan cannot be guaranteed. Barring major changes, it is expected that future CEQA documents for activities that receive take coverage under this Plan will incorporate the conservation measures in this Plan by reference to comply with CEQA for the

covered species and natural communities addressed in this Plan. The Plan implements a conservation strategy designed to achieve a comprehensive set of biological goals and objectives. Furthermore, as an NCCP, the Plan provides for broad-based planning to preserve natural communities at the ecosystem scale.

Many of the conservation measures in the Plan will also benefit other special-status species (i.e., species not covered by the Plan); such measures may be sufficient to meet CEQA standards for these other species as well.

### **1.3.5 Federal and State Wetland Laws and Regulations**

#### **Clean Water Act Section 404**

The Clean Water Act is the primary federal law that protects the physical, chemical, and biological integrity of the nation's waters, including lakes, rivers, wetlands, and coastal waters. Programs conducted under the Clean Water Act are directed at both point source pollution (e.g., waste discharged from outfalls and filling of waters) and nonpoint source pollution (e.g., runoff from parking lots). Under the Clean Water Act, the U.S. Environmental Protection Agency (EPA) and state agencies set effluent limitations and issue permits under Clean Water Act Section 402 governing point-source discharges of wastes to waters. The U.S. Army Corps of Engineers (Corps), applying its regulations under guidelines issued by EPA, issues permits under Clean Water Act Section 404 governing under what circumstances dredged or fill material may be discharged to waters. These Section 402 and 404 permits are the primary regulatory tools of the Clean Water Act. EPA has oversight over all Clean Water Act permits issued by the Corps.

The Corps issues two types of permits under Section 404: general permits (either nationwide permits or regional permits) and standard permits (either letters of permission or individual permits). General permits are issued by the Corps to streamline the Section 404 process for nationwide, statewide, or regional activities that have minimal direct or cumulative environmental impacts on the aquatic environment. Standard permits are issued for activities that do not qualify for a general permit (i.e., that may have more than a minimal adverse environmental impact).

In early 2012, the Local Partners began pursuing a Regional General Permit (RGP) for the Habitat Plan from the San Francisco District of the Corps for activities covered by the Habitat Plan that also dredge or fill wetlands and other waters of the U.S. The purpose of the RGP would be to provide a simplified and streamlined means for the Corps to authorize activities in waters of the U.S., including wetlands and other waters within the Plan's permit area. The Local Partners anticipate that the RGP would be consistent with the current Nationwide permit program, seeking programmatic coverage for impacts to waters of the U.S. equal to or less than 0.5 acre and 300 linear feet. In certain instances, the

RGP may allow for a slightly increased level of impact to waters of the U.S. Once adopted, the RGP would need to be renewed every 5 years.

Implementation of the proposed RGP is expected to substantially streamline Section 404. Issuance of a Section 404 permit often requires the Corps to consult with USFWS to comply with Section 7 of the ESA. This consultation would address the federally listed species covered by the Plan. Accordingly, it is expected that USFWS will not require any mitigation beyond that already required by the Plan. The Section 7 biological opinions issued for this Plan can also serve as the basis for any future biological opinions in the study area for covered activities. In addition, the conservation actions for impacts to wetlands in this Plan may fully satisfy Corps requirements for wetland mitigation.

## **Clean Water Act Section 401 and the Porter-Cologne Water Quality Control Act**

Under Clean Water Act Section 401, states have the authority to certify federal permits for discharges to waters under state jurisdiction. States may review proposed federal permits (e.g., Section 404 permits) for compliance with state water quality standards. The permit cannot be issued if the state denies certification. In California, the State Water Resources Control Board (State Board) and the Regional Water Quality Control Boards (usually referred to as the Regional Boards) are responsible for the issuance of Section 401 certifications.

The Porter-Cologne Water Quality Control Act is the primary state law concerning water quality. It authorizes the State Board and Regional Boards to prepare management plans such as regional water quality plans (RMC Water and Environment, Jones & Stokes 2006) to address the quality of groundwater and surface water. The Porter-Cologne Water Quality Control Act also authorizes the Regional Boards to issue waste discharge requirements defining limitations on allowable discharge to waters of the state. In addition to issuing Section 401 certifications on Section 404 applications to fill waters, the Regional Boards may also issue waste discharge requirements for such activities. Because the authority for waste discharge requirements is derived from the Porter-Cologne Water Quality Control Act and not the Clean Water Act, waste discharge requirements may apply to a somewhat different range of aquatic resources than do Section 404 permits and Section 401 Water Quality certifications. Applicants that obtain a permit from the Corps under Section 404 must also obtain certification of that permit by the Regional Board with jurisdiction over the project site. In the permit area, the San Francisco Regional Board has jurisdiction over the San Francisco Bay watershed, and the Central Coast Regional Board has jurisdiction over the Monterey Bay watershed. The Plan does not include certifications under Section 401 or waste discharge requirements under the Porter-Cologne Water Quality Control Act. These authorizations, if required, must be obtained separately. The Local Partners intend to work with the local Regional Boards to develop a coordinated process for obtaining required permits.

## Lake or Streambed Alteration Agreement

CDFG has jurisdictional authority over streams, lakes, and wetland resources associated with these aquatic systems under California Fish and Game Code Section 1600 et seq. California Fish and Game Code Section 1600 et seq. was repealed and replaced in October 2003 with new Sections 1600–1616 that took effect on January 1, 2004. CDFG has the authority to regulate work that will “substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.” Activities of any person, state, or local governmental agency, or public utility are regulated by CDFG under Section 1602 of the Code. CDFG enters into a streambed or lakebed alteration agreement with the project proponent and can impose conditions on the agreement to ensure no net loss of values or acreage of the stream, lake, associated wetlands, and associated riparian habitat.

The lake or streambed alteration agreement is not a permit, but rather a mutual agreement between CDFG and the project proponent. Because CDFG includes under its jurisdiction streamside habitats that may not qualify as wetlands under the Clean Water Act definition, CDFG jurisdiction may be broader than Corps jurisdiction.

A project proponent must submit a notification of streambed alteration to CDFG before construction. The notification requires an application fee for streambed alteration agreements, with a specific fee schedule to be determined by CDFG. Many of the concerns raised by CDFG during streambed alteration agreement negotiations are related to special-status species. Activities covered by this Plan that need a streambed alteration agreement are expected to fully meet the standards of the streambed alteration agreement through compliance with this Plan for species covered by the Plan.

### 1.3.6 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.), requires Federal agencies to take into account the effects of their actions proposed on properties eligible for inclusion in the National Register of Historic Places. "Properties" are defined as "cultural resources", which includes prehistoric and historic sites, buildings, and structures that are listed on or eligible to the National Register of Historic Places. An undertaking is defined as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency. The issuance of an incidental take permit is an undertaking subject to Section 106 of the NHPA. The USFWS has determined that the area of potential effects for the present undertaking is that area where on-

the-ground project activities will result in take of species. The NHPA and the potential effects of the conservation strategy on resources subject to the NHPA are discussed in detail in the EIR/EIS.

## 1.4 Overview of HCP/NCCP Planning Process

### 1.4.1 Organization of the Planning Process

The Habitat Plan was a coordinated effort by six local agencies (i.e., the Permittees).

- City of Gilroy.
- City of Morgan Hill.
- City of San José.
- County of Santa Clara.
- Santa Clara Valley Water District.
- Santa Clara Valley Transportation Authority.

Although not a Permittee, the Santa Clara County Open Space Authority was also involved in preparing the Plan. Coordination and management of the Plan involved the legislative governing bodies of the six Local Partners, a *Liaison Group* consisting of designated elected officials from each of the Local Partners, a *Management Team* of senior staff managers from each of the Permittees, and a *Stakeholder Group*. A Habitat Plan Program Manager reported to the Management Team and was responsible for day-to-day administration of the planning effort. Each group is described below.

The legislative governing bodies of each Local Partner were responsible for making significant decisions, such as approval or amendment of the Planning Agreement with CDFG and USFWS, approval of project financing, approval of the EIS/EIR, and approval of the draft and final Habitat Plan.

### 1.4.2 Liaison Group

Elected officials from each Local Partner's legislative body met regularly (i.e., at least every other month) as part of the Liaison Group to review and provide guidance on issues to be acted on by the Elected Bodies as well as issues of concern to the Management Team.

### 1.4.3 Stakeholder Group

In October 2005, the Management Team, after consultations with the Liaison Group, established a Stakeholder Group. The Stakeholder Group's approximately 25 members represented a wide variety of interests, including conservation organizations, business and development interests, landowners, agricultural interests, open space land-management organizations, and the general public. The Stakeholder Group, which met monthly, reviewed technical and policy issues and made recommendations to staff and elected officials. Meetings were attended by staff from the Local Partners and the Wildlife Agencies, the Program Manager, and, as needed, consultants. The Stakeholder Group, which was facilitated by a consultant, strove to achieve consensus. When consensus was not possible, all views were reported to the Management Team and, when applicable, to the Liaison Group and the Elected Bodies.

### 1.4.4 Science Advisors

Under its Five-Point Policy, USFWS “encourage[s] the use of scientific advisory committees during development and implementation of an HCP” (65 FR 106 35256, June 1, 2000). Independent scientific input is required by the NCCP Act [Section 2810(b)(5)]. The CDFG provides guidelines for “obtaining independent scientific analysis and input, to assist ... plan participants in meeting scientifically sound principles for the conservation and management of species” for assembling a science advisory group, defining their scope of work, involving a facilitator, and providing scientific advice (California Department of Fish and Game 2002). The science advisory process for the Santa Clara Valley Habitat Plan was guided by CDFG's guidelines.

The Local Partners felt that independent scientific input early in the planning process was critical to the success of the Plan. Names of potential advisors were suggested by Local Partners, Wildlife Agencies, and a consultant hired specifically to help develop and run the selection process, plan and implement the Science Advisors workshop, and coordinate preparation of the Science Advisors final report. None of the scientists was affiliated with the Santa Clara Valley Habitat Plan or the Local Partners. Qualifications of candidates included academic record, publications, and practical experience in the study area or with the covered species. Scientists were selected based on their qualifications within the areas of expertise listed below:

- conservation planning, reserve design, and wildlife corridors;
- vegetation ecology (with an emphasis on grassland ecology and rangeland management);
- ecological modeling;
- aquatic ecology/fisheries (with knowledge of salmonids<sup>19</sup>);

<sup>19</sup> The science advisory process occurred while fish were being considered for coverage by the Local Partners and the Wildlife Agencies, including NMFS.

- hydrology, watershed planning, and fluvial geomorphology;
- plant conservation biology (with experience in local serpentine plants, oak woodlands, or riparian sycamore systems);
- herpetology (with emphasis on locally rare amphibians and reptiles);
- ornithology (with an emphasis on local bird species); and
- invertebrate ecology (with emphasis on metapopulation theory; rare species conservation and recovery).

Science Advisors were also selected based on their availability to actively participate in the process. A two-day workshop was held July 6 and 7, 2006. A portion of this workshop was open to the public. Other components included a group field trip and a closed-door session at which time the advisors could talk amongst themselves without the Local Partners or their consultants present. Topics considered by the advisors included the following:

- evaluation of data adequacy for inclusion in the Plan,
- identification of data gaps and sources of uncertainty,
- formulation of biological goals and objectives to conserve covered species and natural communities,
- identification of preserve-design principles and scientifically sound conservation measures for the local area, and
- development of monitoring and adaptive management guidelines for covered species and habitats.

The Science Advisors produced a report documenting their findings that was made available to the public in December 2006. The Local Partners considered all comments from the Science Advisors' final report when developing the Plan. Some Science Advisors were also consulted at various times during Plan development for their advice or review.

A separate group of science advisors was convened on October 1, 2010 to review the working draft of the western burrowing owl conservation strategy. These science advisors were selected based on their expertise with the species locally in the study area and in southern San Francisco Bay.

## 1.4.5 Management Team

The Management Team, which had primary responsibility for developing the Plan, was made up of senior managers from each Local Partner. The Management Team, Plan Program Manager, and key representatives of the consultants generally met monthly. Responsibilities included making decisions that were outside the responsibility of the Elected Bodies and providing direction to local staff working on the Plan, consultants, and the Plan Program Manager. The Management Team and Program Manager actively and regularly coordinated with representatives of the three Wildlife Agencies in development of the Plan.

## 1.4.6 Local Agency and Wildlife Agency Technical Coordination

Representatives of the Local Partners, consultants, and the Wildlife Agencies held monthly meetings to address project coordination and technical issues.

## 1.4.7 Consultant Team

This Plan was prepared by a consultant team under the guidance and direction of the Management Team and the Liaison Group. The Consulting Team consisted of scientific, planning, legal, and other technical staff from ICF International (formerly Jones & Stokes) in San José, Oakland, San Francisco, and Sacramento; Moore Iacofano Goltsman (MIG) in Berkeley; Kleinschmidt Associates in Grass Valley; Land Use Planning Services in Palo Alto; Willdan (formerly MuniFinancial) and Hausrath Associates in Oakland; Albion Environmental in Santa Cruz; Dr. Jerry Smith (San José State University); Resources Law Group in Sacramento; and CH2M Hill in Sacramento.

The members of the Consulting Team had the following responsibilities.

- Land Use Planning Services: Program Management.
- ICF International: development of the Plan and public outreach.
- MIG: stakeholder facilitation.
- Kleinschmidt Associates: Science Advisors selection and facilitation.
- Willdan (MuniFinancial) and Hausrath Economics Group: cost and funding analysis (with assistance from ICF International).
- Albion Environmental: western burrowing owl analysis.
- Dr. Jerry Smith: aquatic analysis.
- Lawrence Ford, Ph.D., LD Ford Rangeland Conservation Science: rangeland conservation.
- CH2M Hill: EIS/EIR preparation.
- Resources Law Group: Implementing Agreement drafting and other legal documents.

## 1.4.8 Public Outreach and Involvement

Public involvement has been an integral part of the process of developing this Plan. Stakeholders and the public have been actively involved throughout the planning process and have had the following opportunities to provide their input and influence the development of the Plan:

- at least quarterly public meetings of the Liaison Group,



- approximately monthly public meetings of the Stakeholder Group,
- a public workshop of the Habitat Plan Science Advisors,
- community public meetings hosted by the Local Partners at key project milestones (approximately one per year),
- public scoping and public-involvement meetings associated with the CEQA/NEPA process,
- periodic presentations to official governing bodies of participating agencies (e.g., boards, councils, planning commissions),
- many presentations to interested organizations upon request, and
- approximately annual training sessions and tours.

In addition, a website announcing all public meetings, posting all public documents, and accepting comments and feedback was used to engage and inform the public.

The Local Partners developed this Plan in compliance with public involvement guidelines established by USFWS and NMFS (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996) and the requirements of the NCCP Act.

## 1.5 Document Organization

This Plan and supporting information are presented in the chapters and appendices listed below. Volumes 1, 2, and 3 contain the Habitat Plan, and Volume 4 contains all appendices.

### Volume 1

- Chapter 1, *Introduction*, discusses the background, purpose, and objectives of the Plan; reviews the regulatory setting; and summarizes the Habitat Plan process.
- Chapter 2, *Land Use and Covered Activities*, describes the land uses of the study area and the activities covered under the Plan.
- Chapter 3, *Physical and Biological Resources*, describes the existing conditions of the study area relevant to the Plan.

### Volume 2

- Chapter 4, *Impact Assessment and Level of Take*, presents the impacts of the covered activities.
- Chapter 5, *Conservation Strategy*, summarizes the conservation strategy and describes the specific conservation actions to be implemented to mitigate the

impacts of the covered activities and contribute to the recovery of the covered species.

- Chapter 6, *Conditions on Covered Activities and Application Process*, describes the specific surveys and other actions required of all covered activities to avoid and minimize impacts to covered species consistent with federal and state regulations.

### Volume 3

- Chapter 7, *Monitoring and Adaptive Management Program*, discusses the monitoring requirements and adaptive management procedures associated with implementation of conservation actions and reserve management.
- Chapter 8, *Plan Implementation*, details the administrative requirements associated with Plan implementation and the roles and responsibilities of the Permittees and Wildlife Agencies.
- Chapter 9, *Costs and Funding*, reviews the costs associated with Plan implementation and the funding sources proposed to pay for those costs.
- Chapter 10, *Assurances*, describes the protections for Permittees and neighboring landowners in the event of changed circumstances or unforeseen circumstances, as well as the procedures for modifying or amending the Plan.
- Chapter 11, *Alternatives to Take*, presents the required analysis of alternatives to take of covered species.
- Chapter 12, *List of Preparers*, identifies the individuals involved in the preparation of this document.
- Chapter 13, *Literature Cited*, is a comprehensive bibliography of references cited in the text.

### Volume 4

- Appendix A, *Glossary*, is a list of terms and their definitions used in this document.
- Appendix B, *Implementing Agreement*, is a copy of the Implementing Agreement that will be entered into by the Permittees and the Wildlife Agencies. This appendix includes three attachments including a covered species list, the *Implementing Ordinance Template*, and the *Neighboring Landowner Certificate of Inclusion*.
- Appendix C, *Evaluation of Special-Status Species for Coverage in the Habitat Plan*, lists the special-status species that were considered for coverage under this Plan, their legal status, their coverage under the Plan (covered or not covered status), and the rationale for coverage.
- Appendix D, *Species Accounts*, presents detailed ecological accounts of all covered species, including models of habitat distribution (i.e., habitat models) that were developed for selected species.

- Appendix E, *Nitrogen Deposition Contribution Estimates*, provides a technical report on the effects of covered activities on airborne nitrogen and its deposition on serpentine grasslands and other habitats in the study area.
- Appendix F, *Climate Change Analysis*, provides technical details supporting the discussion of the potential effects of climate change on the Reserve System and covered species.
- Appendix G, *Cost Model*, describes the cost model used to estimate Plan costs described in Chapter 9.
- Appendix H, *Conservation Easement Template*, is the template that will be used for conservation easements that protect Reserve System lands.
- Appendix I. Not used.
- Appendix J, *Monitoring at Different Levels*, describes the three levels at which monitoring is conducted. This technical detail supports Chapter 7.
- Appendix K, *California Tiger Salamander Hybridization*, provides technical details supporting the conservation strategy for California tiger salamander in Chapter 5.
- Appendix L, *Fish Habitat Assemblage Data*, provides an overview of mapping methods and results for native fish communities in the study area.
- Appendix M, *Western Burrowing Owl Conservation Strategy*, provides details on the conservation strategy for the western burrowing owl which are summarized in Chapter 5.
- Appendix N, *Burrowing Owl Population Viability Analysis Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP)—March 2010*, is a technical report supporting the western burrowing owl conservation strategy (Appendix M).
- Appendix O, *List of Acronyms and Abbreviations*, lists the acronyms and abbreviations used in this document. It can be folded out for convenient reference.



**Table 1-1.** Local Planning Documents and Time Horizons Relevant to the Permit Term

Document	Date Produced	Projection/ Time Horizon	Plan Duration
Bay Area Integrated Regional Water Management Plan (SCVWD)	2006	2026	20 years
City of Gilroy General Plan	2000 (adopted in 2002)	2020	18 years
City of Morgan Hill General Plan	July 2001; as amended to July 2006	2025	24 years
City of San José General Plan	2011	2040	30 years
County of Santa Clara General Plan	1994; updated 2001	2010	16 years
Coyote Watershed Stream Stewardship Plan (SCVWD)	2002	At least until 2016	14 years
Guadalupe Watershed Stream Stewardship Plan (SCVWD)	2006	living document	Not defined
Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) Settlement Agreement and Three Creeks HCP (SCVWD)	Under development	—	50 years
Flood Protection and Stream Stewardship Program (SCVWD) (capital improvements are included in this plan)	Adopted by the Board of Directors and approved by the voters in November 2000	2001–2016	15 years
Pajaro River Watershed Integrated Regional Water Management Plan	2007	2027	20 years
South County Airport Master Plan Report (Santa Clara County)	2006	2025	20 years
Strategic Plan for the Santa Clara County Parks and Recreation System	2003	2013	10 years
Urban Water Management Plan 2005 (SCVWD)	2005	2030	25 years
Valley Transportation Plan 2035 (VTA)	2009	2035	25 years

Sources: City of Gilroy 2002; City of Morgan Hill 2001; City of San José 2011; County of Santa Clara 1994, 2006; County of Santa Clara, Parks and Recreation Department 2003; Santa Clara Valley Water District 2000, 2002a, 2002b, 2005b; Santa Clara Valley Transportation Authority 2009.

**Table 1-2.** Species Proposed for Coverage in the Santa Clara Valley Habitat Plan

Species	Scientific Name	Status <sup>1</sup>	
		State/CNPS	Federal
Invertebrates			
Bay checkerspot butterfly	<i>Euphydryas editha bayensis</i>	–	FT
Amphibians and Reptiles			
California tiger salamander	<i>Ambystoma californiense</i>	ST	FT
California red-legged frog	<i>Rana draytonii</i>	CSC	FT
Foothill yellow-legged frog	<i>Rana boylei</i>	CSC	–
Western pond turtle	<i>Clemmys marmorata</i>	CSC	–
Birds			
Western burrowing owl	<i>Athene cunicularia hypugea</i>	CSC	MBTA
Least Bell’s vireo	<i>Vireo bellii pusillus</i>	SE	FE, MBTA
Tricolored blackbird	<i>Agelaius tricolor</i>	CSC	MBTA
Mammals			
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	ST	FE
Plants			
Tiburon Indian paintbrush	<i>Castilleja affinis</i> ssp. <i>neglecta</i>	ST/1B	FE
Coyote ceanothus	<i>Ceanothus ferrisiae</i>	1B	FE
Mount Hamilton thistle	<i>Cirsium fontinale</i> var. <i>campylon</i>	1B	–
Santa Clara Valley dudleya	<i>Dudleya abramsii</i> ssp. <i>setchellii</i>	1B	FE
Fragrant fritillary	<i>Fritillaria liliacea</i>	1B	–
Loma Prieta hoita	<i>Hoita strobilina</i>	1B	–
Smooth lessingia	<i>Lessingia micradenia</i> var. <i>glabrata</i>	1B	–
Metcalf Canyon jewelflower	<i>Streptanthus albidus</i> ssp. <i>albidus</i>	1B	FE
Most beautiful jewelflower	<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	1B	–

Notes:

<sup>1</sup> Status**Federal**

FE Federally Endangered.

FT Federally Threatened.

BGPA Bald and Golden Eagle Protection Act.

MBTA Migratory Bird Treaty Act.

SOC Species of Concern (National Marine Fisheries Service only).

**State**

SE State Listed as Endangered.

ST State Listed as Threatened.

SR State Listed as Rare.

SC Candidate.

CSC California Special Concern Species.

FP Fully Protected.

**California Native Plant Society (CNPS)**

1B Rare, Threatened, or Endangered in California and Elsewhere.

**Table 1-3. Checklist for NCCP Act Requirements**

Requirement (Fish and Game Code Section)	Applicable Habitat Plan Sections <sup>1</sup>
The plan was developed in accordance with the process identified in the planning agreement per Section 2810. (2820(a)(1))	Chapter 1 <i>Introduction</i> , Section 1.1.3 <i>Background</i> and Section 1.3.1 <i>Federal and State Endangered Species Laws</i> subheading <i>Natural Community Conservation Planning Act</i> Chapter 8 <i>Plan Implementation</i> , Section 8.6.2 <i>Land Acquired by Other Organizations or through Partnerships</i> subheading <i>Land Acquisition during Plan Development (Interim Conservation)</i>
The plan integrates adaptive management strategies that are periodically evaluated and modified based on information from monitoring programs and other sources; these strategies assist conservation of covered species and ecosystems within the plan area. (2820(a)(2))	Chapter 5, <i>Conservation Strategy</i> , Section 5.3, <i>Conservation Actions</i> Chapter 6 <i>Conditions on Covered Activities and Application Process</i> , Section 6.3 <i>Conditions on All Covered Activities</i> Chapter 7 <i>Monitoring and Adaptive Management Program</i> , Section 7.1.1 <i>Regulatory Context</i> , Section 7.1.2 <i>Adaptive Management</i> , and Section 7.3 <i>Monitoring and Management Actions</i> Figure 7-2 <i>Adaptive Management Process</i>
[The plan] Protects habitat, natural communities, and species diversity on a landscape or ecosystem basis through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the plan area. (2820(a)(3))	Chapter 1 <i>Introduction</i> , Section 1.1.2 <i>Purpose</i> Chapter 5 <i>Conservation Strategy</i> , Section 5.2.3 <i>Reserve System</i> , Section 5.2.4 <i>Aquatic Habitat Protection and Enhancement</i> , Section 5.2.5 <i>Land Management</i> , Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> through Section 5.3.7 <i>Wetland and Pond Conservation and Management</i>
[The plan] Conserves, restores, and manages representative natural and semi-natural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem function, and biological diversity. (2820(a)(4)(A))	Chapter 3 <i>Physical and Biological Resources</i> , Section 3.3.1 <i>Definitions</i> , Section 3.3.4 <i>Biological Diversity of the Study Area</i> , and Section 3.3.5 <i>Natural Communities and Land-Cover Types</i> (ecosystems discussed in each Natural Community) Chapter 5 <i>Conservation Strategy</i> , Section 5.2.3 <i>Reserve System</i> , Section 5.2.4 <i>Aquatic Habitat Protection and Enhancement</i> , Section 5.2.5 <i>Land Management</i> , Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> through Section 5.3.7 <i>Wetland and Pond Conservation and Management</i>
[The plan] Establishes one or more reserves or proposes other measures that provide equivalent conservation of covered species within the plan area and linkages between them and adjacent habitat areas outside of the plan area. (2820(a)(4)(B))	Chapter 5 <i>Conservation Strategy</i> , Section 5.2.3 <i>Reserve System</i> subheading <i>Landscape Linkages</i> , Section 5.2.4 <i>Aquatic Habitat Protection and Enhancement</i> , and Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> Table 5-9 <i>Landscape Linkages in and Near the Study Area Considered for the Reserve Design</i> Table 5-5 <i>Existing Open Space and Interim Conservation Lands Proposed for the Reserve System and Specific Conservation Actions within Each Site</i> Figure 5-6 <i>Potential Landscape Linkages in and Near the Study Area</i> Figure 5-8 <i>Land Acquisition Strategy with Applicable Landscape Linkages</i>

Requirement (Fish and Game Code Section)	Applicable Habitat Plan Sections <sup>1</sup>
[The plan] Protects and maintains habitat areas that are large enough to support sustainable populations of covered species. (2820(a)(4)(C))	<p>Chapter 5 <i>Conservation Strategy</i>, Section 5.2.1 <i>Biological Goals and Objectives</i> subheading <i>Natural Community–Level Goals</i>, and Section 5.4 <i>Benefits of and Additional Conservation Actions for Covered Species</i> (descriptions for each covered species)</p> <p>Table 5-16 <i>Species Occurrences, Impacts, and Conservation Requirements for Covered Plants</i></p> <p>Table 5-17 <i>Commitments to Acquire and Enhance Modeled Habitat in the Reserve System for Covered Species with Models (acres)</i></p>
[The plan] Sustains the effective movement and interchange of organisms between habitat areas to maintain ecological integrity of habitat within the plan area. (2820(a)(4)(E))	<p>Chapter 3 <i>Physical and Biological Resources</i>, Section 3.3.1 <i>Definitions</i> subheading <i>Ecological Integrity</i></p> <p>Chapter 5 <i>Conservation Strategy</i>, Section 5.2.3 <i>Reserve System</i> subheading <i>Landscape Linkages</i>, Section 5.2.4 <i>Aquatic Habitat Protection and Enhancement</i>, Section 5.3.1 <i>Land Acquisition and Restoration Actions</i>, and Section 5.3.2 <i>Landscape Conservation and Management</i> subheading <i>Connectivity and Permeability</i></p> <p>Table 5-9 <i>Landscape Linkages in and Near the Study Area Considered for the Reserve Design</i></p> <p>Figure 5-6 <i>Potential Landscape Linkages in and Near the Study Area</i></p> <p>Figure 5-8 <i>Land Acquisition Strategy with Applicable Landscape Linkages</i></p>
The plan incorporates a range of environmental gradients (such as slope, elevation, aspect, and coastal or inland characteristics) and high habitat diversity; this provides for shifting distributions of species due to changed circumstances. (2820(a)(4)(D))	<p>Chapter 3 <i>Physical and Biological Resources</i>, Section 3.2.2 <i>Topography</i>, Section 3.2.4 <i>Soils</i>, Section 3.2.5 <i>Climate and Hydrology</i>, Section 3.3.1 <i>Definitions</i> subheading <i>Environmental Gradients</i></p> <p>Figure 3-1 <i>Santa Clara Valley HCP/NCCP Topography</i></p> <p>Figure 3-2 <i>Santa Clara Valley HCP/NCCP Slope in Degrees</i></p> <p>Figure 3-3 <i>Soils in the Santa Clara Valley HCP/NCCP Area</i></p> <p>Figure 3-4 <i>Santa Clara Valley HCP/NCCP Serpentine Areas</i></p> <p>Figure 3-5 <i>Average Annual Rainfall in HCP/NCCP Study Area</i></p> <p>Figure 3-6 <i>Santa Clara Valley HCP/NCCP Watersheds</i></p> <p>Chapter 5 <i>Conservation Strategy</i>, Section 5.3.2 <i>Landscape Conservation and Management</i> subheading <i>Biological Goals and Objectives</i></p> <p>Table 5-1a <i>Biological Goals, Objectives and Conservation Actions: Landscape Level</i></p> <p>Table 5-11 <i>Land Acquisition and Enhancement Requirements within the Study Area for Selected Terrestrial Land-Cover Types (acres)</i></p>



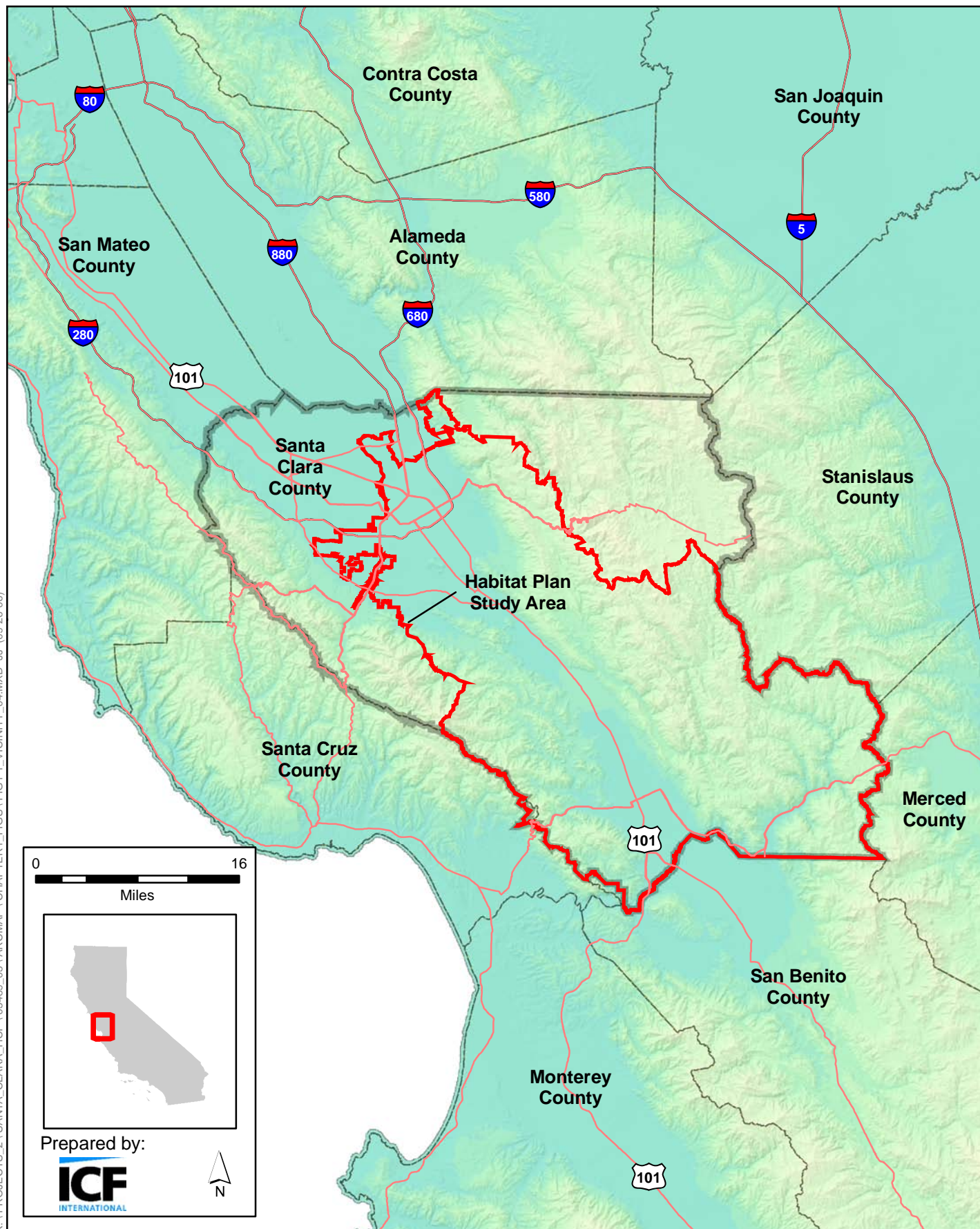
Requirement (Fish and Game Code Section)	Applicable Habitat Plan Sections <sup>1</sup>
The plan identifies allowable activities and restrictions within reserve areas compatible with conservation of species, habitats, natural communities, and associated ecological functions. (2820(a)(5))	<p>Chapter 2 <i>Land Use and Covered Activities</i>, Section 2.3.8 <i>Conservation Strategy Implementation</i></p> <p>Chapter 4 <i>Impact Assessment and Level of Take</i>, Section 4.3.7 <i>Conservation Strategy Implementation</i> subheading <i>Activities within the Reserve System</i></p> <p>Chapter 6 <i>Conditions on Covered Activities and Application Process</i>, Section 6.4.6 <i>Reserve System Implementation</i> subheadings <i>Condition 9. Prepare and Implement a Recreation Plan</i> and <i>Condition 10. Fuel Buffer</i>, Section 6.5 <i>Conditions to Minimize Impacts on Natural Communities</i> subheading <i>Condition 11. Stream and Riparian Setbacks</i> (most other Conditions also apply to the Reserve System)</p>
The plan contains specific conservation measures that meet the biological needs of covered species and that are based on the best available scientific information about the status of covered species and the impacts of permitted activities on those species. (2820(a)(6))	<p>Chapter 3 <i>Physical and Biological Resources</i>, Section 3.3.3 <i>Covered Species</i></p> <p>Chapter 5 <i>Conservation Strategy</i>, Section 5.4 <i>Benefits of and Additional Conservation Actions for Covered Species</i></p> <p>Table 5-1c <i>Biological Goals, Objectives and Conservation Actions: Wildlife</i></p> <p>Table 5-1d <i>Biological Goals, Objectives and Conservation Actions: Plants</i></p> <p>Chapter 6 <i>Conditions on Covered Activities and Application Process</i></p> <p>Appendix D <i>Species Accounts</i> (for best available scientific information on the covered species)</p>
The plan contains a monitoring program. (2820(a)(7))	Chapter 7 <i>Monitoring and Adaptive Management Program</i>
The plan contains an adaptive management program. (2820(a)(8))	Chapter 7 <i>Monitoring and Adaptive Management Program</i>
The plan includes an estimated timeframe and process for implementing reserves or other conservation measures, including obligations of landowners and plan signatories and consequences for failure to acquire lands in a timely manner. (2820(a)(9))	<p>Chapter 5 <i>Conservation Strategy</i>, Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> subheading <i>Stay-Ahead Provision and Rough Proportionality</i></p> <p>Tables 5-1a and 5-1b <i>Biological Goals, Objectives and Conservation Actions: Landscape-Level and Natural Community-Level</i></p> <p>Table 5-14 <i>Commitments by Time Period for Restoration and Creation Requirements that Contribute to Species Recovery</i></p> <p>Chapter 8 <i>Plan Implementation</i>, Section 8.6.1 <i>Stay-Ahead Provision</i></p>
The plan ensures that mitigation and conservation measures are roughly proportional in time and extent to the impact on habitat or covered species authorized under the plan. These provisions identify (a) the conservation measures—including assembly of reserves where appropriate and implementation of monitoring and management activities—that the landowner will maintain or carry out in rough proportion to the impact on habitat or covered species and (b) the measurements that will be used to determine if this occurs. (2820(b)(3)(D)(9))	<p>Chapter 5 <i>Conservation Strategy</i>, Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> subheading <i>Stay-Ahead Provision and Rough Proportionality</i></p> <p>Table 5-1a <i>Biological Goals, Objectives and Conservation Actions: Landscape Level</i></p> <p>Table 5-1b <i>Biological Goals, Objectives and Conservation Actions: Natural Community Level</i></p> <p>Table 5-1c <i>Biological Goals, Objectives and Conservation Actions: Wildlife</i></p> <p>Table 5-1d <i>Biological Goals, Objectives and Conservation Actions: Plants</i></p>

Requirement (Fish and Game Code Section)	Applicable Habitat Plan Sections <sup>1</sup>
	<p>Table 5-11 <i>Land Acquisition and Enhancement Requirements within the Study Area for Selected Terrestrial Land-Cover Types</i> (acres)</p> <p>Table 5-12 <i>Required Preservation, Enhancement, Restoration and Creation Mitigation Ratios and Estimated Acquisition, Enhancement, Restoration, and Creation Requirements for Aquatic Land Cover Types</i></p> <p>Table 5-16 <i>Species Occurrences, Impacts, and Conservation Requirements for Covered Plants</i></p> <p>Chapter 8 <i>Plan Implementation</i>, Section 8.6.1 <i>Stay-Ahead Provision</i></p>
The plan ensures adequate funding to carry out the conservation measures identified in the plan. (2820(a)(10))	<p>Chapter 9 <i>Costs and Funding</i>, Section 9.4 <i>Funding Sources and Assurances</i></p> <p>Table 9-5 <i>Funding Sources</i></p>
<p>The plan defines species coverage, including any conditions of coverage (2820(b)(1)).</p> <p>The plan establishes long-term protection of habitat reserves or provides equivalent conservation of covered species (2820(b)(2)).</p>	<p>Chapter 3 <i>Physical and Biological Resources</i>, Section 3.3.3 <i>Covered Species</i></p> <p>Chapter 5 <i>Conservation Strategy</i>, Section 5.2.3 <i>Reserve System</i>, Section 5.2.4 <i>Aquatic Habitat Protection and Enhancement</i>, and Section 5.3.1 <i>Land Acquisition and Restoration Actions</i></p>
<p>The plan defines specific terms and conditions, which, if violated, would result in the suspension or revocation of the permit, in whole or in part. CDFG will include a provision requiring notification to the plan participant of a specified period of time to cure any default prior to suspension or revocation of the permit in whole or in part. These terms and conditions will address, but are not limited to, provisions specifying the actions CDFG will take under all of the following circumstances (2820(b)(3)):</p> <p>The plan participant fails to provide adequate funding.</p> <p>The plan participant fails to maintain the rough proportionality between impacts on habitat or covered species and conservation measures.</p> <p>The plan participant adopts, amends, or approves any plan or project without the concurrence of the wildlife agencies that is inconsistent with the objectives and requirements of the approved plan.</p> <p>The level of take exceeds that authorized by the permit.</p>	<p>Chapter 5 <i>Conservation Strategy</i>, Section 5.3.1 <i>Land Acquisition and Restoration Actions</i> subheading <i>Stay-Ahead Provision and Rough Proportionality</i></p> <p>Chapter 6, <i>Conditions on Covered Activities and Application Process</i>, Section 6.1 <i>Introduction</i> (regarding approval of plans or project inconsistent with the Plan)</p> <p>Chapter 8 <i>Plan Implementation</i>, Section 8.6.1 <i>Stay-Ahead Provision</i></p> <p>Chapter 9 <i>Costs and Funding</i>, Section 9.4 <i>Funding Sources and Assurances</i>, Section 9.4.4 <i>Funding Adequacy</i></p> <p>Table 9-5 <i>Funding Sources</i></p> <p>Implementing Agreement, Section 16.3 <i>Suspension of the State Permit</i></p>
The plan specifies procedures for amendment of the plan and the implementation agreement (2820(b)(4)).	Chapter 10 <i>Assurances</i> , Section 10.3 <i>Modifications to the Plan</i>
The plan ensures implementation of a monitoring program and adaptive management program. (2820(b)(5)).	Chapter 7 <i>Monitoring and Adaptive Management Program</i> , Section 7.1.1 <i>Regulatory Context</i>
The plan provides for oversight of plan implementation to assess mitigation performance, funding, and habitat protection measures. (2820(b)(6))	Chapter 8 <i>Plan Implementation</i> , Section 8.3.8 <i>Reserve Management and Monitoring</i> subheading <i>Structure of the Adaptive Management Decision-Making Process</i> and Section 8.10 <i>Data Tracking</i>

Requirement (Fish and Game Code Section)	Applicable Habitat Plan Sections <sup>1</sup>
The plan provides for periodic reporting to the wildlife agencies and the public for purposes of information and evaluation of plan progress. (2820(b)(7))	Chapter 8 <i>Plan Implementation</i> , Section 8.11 <i>Reporting</i>
The plan provides mechanisms to ensure adequate funding to carry out the conservation actions identified in the plan. (2820(b)(8))	Chapter 9 <i>Costs and Funding</i> , Section 9.4 <i>Funding Sources and Assurances</i> Table 9-5 <i>Funding Sources</i>
The plan stipulates that if a participant does not maintain proportionality between <i>take</i> and conservation measures specified in the implementation agreement and does not either (a) cure the default within 45 days or (b) enter into an agreement with CDFG within 45 days to expeditiously cure the default, CDFG will suspend or revoke the permit, in whole or in part. (2820(c))	Chapter 8 <i>Plan Implementation</i> , Section 8.6.1 <i>Stay-Ahead Provision</i> subheading <i>Measurement of Stay-Ahead Provision</i> Implementing Agreement, Section 16.3.1 <i>Failure to Maintain Rough Proportionality</i>
The plan requires that data and reports associated with monitoring programs be available for public review; the landowner must also conduct public workshops on an annual basis to provide information and evaluate progress toward attaining the conservation objectives of the plan. (2820(d))	Chapter 7 <i>Monitoring and Adaptive Management Program</i> , Section 7.4 <i>Data and Reporting</i> , and Section 7.2.3 <i>Program Implementation</i> subheading <i>Program Infrastructure</i> Chapter 8 <i>Plan Implementation</i> , Section 8.2.7 <i>Public Input</i> , and Section 8.11 <i>Reporting</i>
Note:	
<sup>1</sup> Only the primary applicable sections of the Plan are listed. Other sections may apply or be cross-referenced by the sections listed in this table.	



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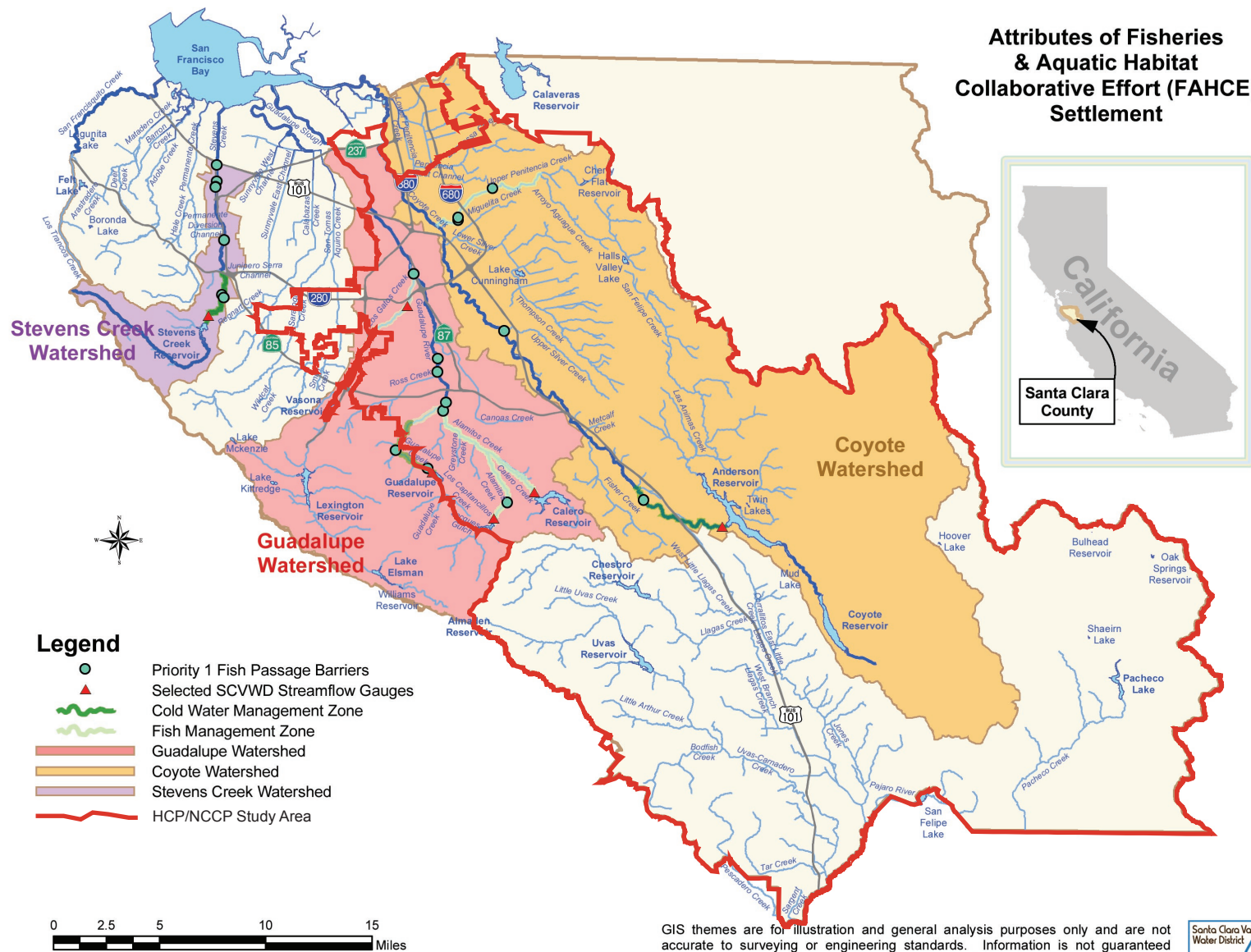
**Figure 1-1**  
**Regional Location of the Habitat Plan Study Area**



**Figure 1-2**

**Santa Clara Valley Habitat Plan Study Area and Permit Area**





**Figure 1-3  
FAHCE Program Boundary**





## Chapter 2

# Land Use and Covered Activities

## 2.1 Introduction

This chapter examines existing land use conditions and land use plans in the study area, and describes activities covered under the Plan. The land use component of this chapter provides an overview of the major land use and open space management agencies operating within the study area and provides a brief description of each agency's mission and jurisdiction. The description of land use provides the necessary context for the covered activities upon which the impact analysis (Chapter 4) is based. This chapter provides history and context for future development in the study area, reviews existing land-use conditions and relevant land use plans; presents the criteria used to determine land use categories for the Plan; discusses significant existing open spaces in the study area and open space type classification; and describes the projects and activities within the permit area that will be covered under the incidental take permits.

## 2.2 Land Use and Jurisdictions

### 2.2.1 Existing Conditions

Santa Clara County encompasses 835,449 acres (1,305 square miles), 519,506 acres (810 square miles, or 62% of the County) of which are included in the study area of this Plan. The fertile Santa Clara Valley (Valley) runs the entire length of the County from north to south, ringed by the rolling hills of the Diablo Range on the east and the Santa Cruz Mountains on the west. Salt marshes, tidal wetlands, and mostly abandoned salt ponds lie in the northern part of the County, adjacent to San Francisco Bay (County of Santa Clara 2006a) (see **Figure 1-1** for the regional location of the Plan study area).

The Valley is generally split into two geographic regions, the North Valley and the South Valley. The North Valley is extensively urbanized and houses approximately 90% of the County's residents. Thirteen of the County's fifteen cities are located in the North Valley, while the remaining two cities, Gilroy and Morgan Hill, are located in the South Valley. The South Valley remains predominantly rural, with the exception of Gilroy, Morgan Hill, small unincorporated community of San Martin, and scattered residential areas generally having parcels of five acres or smaller that were created in or before the

1960s. Low-density residential developments are also scattered along the Valley floor and foothill areas (County of Santa Clara 2006b).

Once known as the “Valley of Heart’s Delight,” orchards and other agriculture dominated this area in the early to mid-20th century. Over the past several decades, the County has transformed into “Silicon Valley,” a major global center of high-tech development and the Internet boom of the 1990s. The population growth of the County reflected this dramatic shift in local industry. Between 1980 and 1990, Santa Clara County grew by 202,506 people (16%). Similarly, between 1990 and 2000, the County grew by an additional 185,008, a 12% increase in population. Between 1990 and 2000, most of the population growth in Santa Clara County occurred in San José and in the North Valley cities (Campbell, Cupertino, Los Altos, Los Altos Hills, Los Gatos, Milpitas, Monte Sereno, Mountain View, Palo Alto, Santa Clara, Saratoga, and Sunnyvale). Although North Valley cities experienced a larger increase in population numbers, the South Valley cities of Morgan Hill and Gilroy experienced a larger-than-average percentage increase in population (County of Santa Clara 2006b).

The County’s current population of over 1.7 million is one of the largest in the state and is the largest of the nine Bay Area counties. Its population constitutes approximately one-fourth of the Bay Area’s total population and the County provides more than 25% of all jobs in the Bay Area. Nearly 92% of the County population lives in its cities (County of Santa Clara 2006a). Of the fifteen cities located in Santa Clara County, only Gilroy, Morgan Hill, and San José are covered by the Plan.

It is predicted that the County’s population will continue to grow, but at a slower rate than in the recent past. Moderate rates of growth in employment and housing development may account for this slowdown in population growth (County of Santa Clara 2006b). According to the Association of Bay Area Governments, Santa Clara County’s population is projected to reach 1,855,500 by 2010 and 2,073,300 by 2020 (Association of Bay Area Governments 2005).

The Association of Bay Area Governments develops population projections for Bay Area cities and counties every two years. City populations generally include the full Local Agency Formation Commission (LAFCO)-defined sphere of influence. In 2005, the cities of Gilroy, Morgan Hill and San José had a total population of 1,079,500, 62% of the County’s population. The population of these cities is projected to reach 1,310,400 by 2010 and 1,455,800 by 2020, 62% and 63% of projected County population, respectively. The population of Santa Clara County exclusive of the cities was 15,400 (Association of Bay Area Governments 2005).

As early as 1970, the County and cities of the Valley anticipated this type of rapid growth and began implementing policies that would help guide development, curtail sprawl, and protect the abundant natural resources of the region. A critical policy was and is that urban growth would occur within cities and not in unincorporated Santa Clara County. After several decades, the County remains keenly aware of the need to guide development so that social, economic, and environmental resources are protected. Many of the policies in the current

County general plan address land use issues involving the rural unincorporated areas of the County over which the County has direct land use authority. The overall direction of these policies is to maintain the scenic rural character of these areas and to promote conservation and productive use of their natural resources for agriculture, ranching, watershed, public recreation, and wildlife habitat.

An important cornerstone of the County general plan is a vision of “compact development” as an overall approach to managing future growth. Compact development means that most future growth is directed into appropriate locations within existing urban areas, particularly along transit corridors and closer to employment centers rather than sprawling outward into the hillsides and the rural countryside.

The Cities of Gilroy, Morgan Hill, and San José maintain a strong commitment to protect the natural and agricultural resources surrounding their respective cities. Reflecting this vision, Morgan Hill and San José, have adopted an ultimate buildout line (termed the “planning limit of urban growth” for the purposes of this Plan). Gilroy’s General Plan 2020 urban expansion line may be extended in future general plan updates (for additional detail, see Section 2.4 *Projects and Activities Not Covered by this Plan*). More detail on each city’s development and open space policies, and planning limit of urban growth boundaries is provided below.

Background information for each of the Local Partners is provided below.

## Gilroy

Gilroy, known as the “Garlic Capital of the World,” is located close to the southern border of Santa Clara County where U.S. 101 intersects with State Route (SR) 152. Gilroy is known for its rural residential environment, its award-winning parks, and for its “urban forest,” for which the City has won Tree City USA awards annually since 1979 (City of Gilroy 2006a).

The City of Gilroy adopted its most recent general plan on June 13, 2002 (City of Gilroy 2002a). This document is a statement of community values and priorities, projecting out to the year 2020. The vision for Gilroy’s future emphasizes a compact pattern of development, surrounded by open space and working agricultural lands, helping to retain the City’s small-town character and rural atmosphere. In addition to the general plan, Gilroy recently developed the Hecker Pass Specific Plan to “protect and enhance the Hecker Pass Area’s rural character, open space, and agricultural uses” (City of Gilroy 2005b).

The City of Gilroy anticipates buildout of the city will occur within the existing general plan boundary over the course of the Plan permit term. Therefore, the City’s general plan boundary will be used to represent the City’s planning limit of urban growth for this Plan. The general plan boundary is the area of evaluation in the City of Gilroy General Plan that represents a 20-year

development time frame. The general plan was adopted in 2002 and represents a buildout to 2020 (C. Casper pers. comm.).

## Population, Housing, and Employment

The population of Gilroy was 47,671 people in 2005 and is projected to reach 64,600 in 2020 and 66,400 in 2030, an increase of 36% and 39% over 2005 values, respectively<sup>1</sup>.

Households in Gilroy numbered 15,450 in 2005. The number of households is projected to reach 18,350 in 2020 and 19,050 in 2030, an increase of 19% and 23% over 2005 values, respectively.

Jobs in Gilroy numbered 22,430, or 2.1% of total jobs Countywide, in 2005. The number of jobs is projected to reach 32,690 in 2020 and 34,950 in 2030, 2.8% and 2.6% of projected jobs Countywide, respectively (Association of Bay Area Governments 2005).

## Conservation and Open Space Policies

The City of Gilroy has adopted several policies related to protection and conservation of open space. A selection of these policies from the general plan and from the Hecker Pass Specific Plan is listed below (City of Gilroy 2002a, 2005b).

### Gilroy General Plan

**Policy 20.01, Open Space Areas; Policy 20.02, Creek Protection.** Ensure protection of creeks (including small canyons and seasonal creeks) that flow through the area, preserving their natural drainage function through adequate setbacks and easements.

**Policy 1.09, Clustered Development; Policy 20.01, Open Space Areas; Policy 20.03, Plant and Wildlife Habitats; Policy 20.04, Rare and Endangered Species.** Ensure protection of natural resource and wildlife habitat areas.

**Policy 1.09, Clustered Development; Policy 20.01, Open Space Areas.** Respect the natural topography to the greatest extent possible, retaining significant natural features such as hillsides, trees, and heavily vegetated areas.

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<sup>1</sup> Population, housing, and employment information presented in this chapter is taken from the Association of Bay Area Governments 2005 projections. The projections for each city include lands currently annexed to the city, as well as all currently unincorporated lands within its sphere of influence. Projections for Santa Clara County do not include unincorporated lands within the sphere of influence of the cities. These boundaries are inconsistent with the local growth boundaries of the study-area cities, as discussed later in this chapter.

## Hecker Pass Specific Plan

**Development Controls and Design Standards: Open Space.** A variety of open space areas should be created through the design and development process, including active recreation areas, habitat protection areas, agricultural areas, scenic open spaces, and neighborhood open spaces (interspersed between clusters of residential development). For all open spaces, the Specific Plan should ensure (a) that open space dedications are permanent, and (b) that appropriate mechanisms are in place to address ongoing maintenance and management issues.

## Morgan Hill

Morgan Hill is located in southern Santa Clara Valley, approximately 12 miles south of San José, 10 miles north of Gilroy, and 15 miles inland from the Pacific Coast (City of Morgan Hill 2006). The City of Morgan Hill developed its current general plan in 2001 and made revisions to the plan in 2006 to adopt an urban limit line and greenbelt policies. The general plan envisions:

Morgan Hill keeping its small-town character while offering new opportunities for businesses and amenities for residents. Agriculture will continue at the outskirts, and new housing for a range of incomes will be accommodated in a variety of locations. Urban land uses will be encouraged around the downtown, and incentives would foster infill development instead of sprawl. (City of Morgan Hill 2006.)

The City of Morgan Hill anticipates ultimate buildout of the city will occur within its Urban Limit Line adopted in April, 2006. Therefore, the City's Urban Limit Line will be used to represent the City's planning limit of urban growth for this Plan. The Urban Limit Line separates urban and future urban areas from rural areas. The Urban Limit Line is a longer-term version of the City's Urban Growth Boundary and is intended to reflect the City's long-term policy for growth in Morgan Hill, beyond the 20-year time frame of the Urban Growth Boundary. The purpose of the Urban Limit Line is to encourage more efficient growth patterns, minimize public costs, and protect environmental resources. Some, but not all, of the land outside the Urban Limit Line has been identified as Greenbelt (S. Golden pers. comm.).

## Population, Housing, and Employment

The population of Morgan Hill was 36,423 people in 2005 and is projected to reach 48,000 in 2020 and 50,000 in 2030, an increase of 32% and 37% over 2005 levels, respectively.

Households in Morgan Hill numbered 13,330 in 2005. The number of households is projected to reach 15,590 in 2020 and 16,140 in 2030, an increase of 17% and 21% over 2005 values, respectively.

Jobs in Morgan Hill numbered 14,520, or 1.4% of total jobs Countywide, in 2005. The number of jobs is projected to reach 21,760 in 2020 and 25,570 in 2030, 1.9% and 2.1% of projected jobs Countywide, respectively (Association of Bay Area Governments 2005).

## Conservation and Open Space Policies

The City of Morgan Hill General Plan contains many policies supporting habitat conservation and preservation. The following policies are just a few examples taken from the Open Space and Conservation element of the general plan (City of Morgan Hill 2001a, 2001b, 2006).

**1a.** Work with the County, the Santa Clara Valley Open Space Authority, appropriate conservancy organizations and land trusts, and property owners to preserve large open space areas, such as agricultural lands and outdoor recreation areas to conserve natural resources, retain the city's unique identity.

**1b.** Support agricultural uses that can preserve open space.

**1c.** Preserve and maintain the wide variety of open spaces in the South County. Greenbelts should delineate and provide contrast between the city and adjacent urban areas. A system of city and regional parks should be linked by pedestrian ways, trails, and streamside parks. (South County Joint Area Plan [SCJAP] 16.00.)

**5a.** Encourage reclamation of degraded streams and riparian areas.

**5b.** Maintain riparian systems, stream banks and floodways in open space or related open space uses such as wildlife habitat, recreation or agriculture. (SCJAP 16.10.)

**5c.** A proposed streamside park along West Little Llagas Creek should be actively implemented and connected to the County trail system. (SCJAP 16.10 & 16.12.)

**5d.** Retain natural streamside and riparian areas in their natural state in order to preserve their value as percolation and recharge areas, natural habitat, scenic resources, recreation corridors and for bank stabilization. (SCJAP 15.08.)

**5e.** Where flood control projects are needed to protect existing development, minimize disruption of streams and riparian systems, maintaining slow flow and stable banks through design and other appropriate mitigation measures. (SCJAP 15.08.)

**6a.** Preserve all fish and wildlife habitats in their natural state whenever possible. Consider development impacts upon wildlife and utilize actions to mitigate those environmental impacts.

The City of Morgan Hill also adopted in 2003 and is now implementing a habitat mitigation plan for the western burrowing owl (City of Morgan Hill 2003). To

date, Morgan Hill has preserved one approximately 30-acre site to provide suitable habitat for burrowing owl (Live Oak Associates 2006).

## San José

San José, founded in 1777, was California's first civilian settlement. San José is located in the North Valley, on the eastern side of the Valley and adjacent to the southern tip of the San Francisco Bay. San José is by far the largest city in Santa Clara County, the third largest city in California (after Los Angeles and San Diego), and the tenth largest city in the United States.

Most of the City of San José lies within the study area. Approximately 9% of the city (10,543 acres) is excluded from the study area. (See Chapter 1 for a discussion of how the study area was defined.) Land use in San José is varied and includes a large urban core, as well as approximately 13,780 acres (12% of the incorporated city) of non-urban hillside.

The City of San José 2040 General Plan identifies several "Major Strategies" that represent central themes of planning in the City through 2040. The Greenline/Urban Growth Boundary Major Strategy is directed at preserving the scenic backdrop of the hillsides surrounding San José, preserving land that protects water, habitat, or agricultural resources, and offers recreational opportunities (City of San José 2011).

The City adopted Measure K, the establishment of the Greenline/Urban Growth Boundary, in 2000 with over 81% of voter support. The stated intention of the ballot measure was to develop a clearer geographic identity for San José as well as to preserve valuable open space resources. This line is the anticipated ultimate boundary of urban growth for San José, and the city has several policies in place that would prohibit the expansion of the Greenline/Urban Growth Boundary. As a requirement of the 2000 ballot measure, the boundary may only be repealed or amended by the voters of the City of San José (M. Mena pers. comm.). Therefore, the City's Greenline/Urban Growth Boundary will be used to represent the City's planning limit of urban growth for this Plan.

The City of San José adopted the *Envision San José 2040 General Plan* in November 2011. The revisions do not include an expansion of the Greenline/Urban Growth Boundary.

## Population, Housing, and Employment

The population of San José was 985,000 people in 2005 and is projected to reach 1,196,900 in 2020 and 1,339,400 in 2030, an increase of 22% and 36% over 2005 values, respectively.

Households in San José numbered 309,020 in 2005. The number of households is projected to reach 370,620 in 2020 and 417,790 in 2030, an increase of 20% and 35% over 2005 levels, respectively.

Jobs in San José numbered 375,750, or 36% of jobs Countywide, in 2005. The number of jobs is projected to reach 514,220 in 2020 and 617,790 in 2030, 44% and 46% of projected jobs Countywide, respectively (Association of Bay Area Governments 2005).

## **Conservation and Open Space Policies**

The City of San José has adopted several policies related to the Greenline/Urban Growth Boundary, controlled growth, and protection and conservation of open space. A selection of these policies from the general plan is listed below (City of San José 2011).

- The Greenline/Urban Growth Boundary establishes the maximum extent of urban development. All urban and suburban development should occur within the Greenline/Urban boundary. Areas outside of this boundary are intended to remain permanently rural in character and to contribute to the establishment of a permanent green belt along the City's eastern and southern edges (pp.6-29).
- Prohibit significant modifications of the Greenline/Urban Growth Boundary, as defined by Title 18 of the municipal code, except through a Major General Plan Update process (pp. 6-29).
- Design development at the urban/natural community interface of the Greenline/ Urban Growth Boundary to minimize the length of the shared boundary between urban development and natural areas by clustering and locating new development close to existing development (pp. 3-31).
- Minimize grading on hillsides and design any necessary grading or recontouring to preserve the natural character of the hills and to minimize the removal of significant vegetation, especially native trees such as Valley oaks (pp. 6-26).
- Encourage the preservation of hillside vegetation and require appropriate revegetation and planting of non-invasive plant materials that do not require routine irrigation for projects in hillside areas, if existing vegetation must be removed or substantially disturbed (pp. 6-28).

### **Riparian Corridors (pp. 3-27)**

- Preserve, protect, and restore the City's riparian resources in an environmentally responsible manner to protect them for habitat value and recreational purposes.
- New public and private development adjacent to riparian corridors should be consistent with the provisions of the Riparian Corridor Policy Study and any adopted Santa Clara Valley Habitat Conservation Plan/ Natural Communities Conservation Plan.



- Ensure that a 100-foot setback from riparian habitat is the standard to be achieved in all but a limited number of instances, only where no significant environmental impacts would occur.
- New development should be designed to protect adjacent riparian corridors from encroachment of lighting, exotic landscaping, noise and toxic substances into the riparian zone.
- The City encourages appropriate native plant restoration projects along riparian corridors, upland wetlands, and in adjacent upland areas.
- Develop a City Council Policy based on the City's Riparian Corridor Policy Study and HCP/NCCP to successfully implement the riparian goals and policies of the *Envision General Plan*, which recognizes that a 100-foot setback is the standard to be achieved in all but a limited number of instances, where no significant environmental impacts would occur.

## Contemplates Adoption of HCP

The *Envision San José 2040 General Plan* also specifically contemplates the adoption of the Habitat Plan and incorporates the goals of the Habitat Plan as follows.

- A long-range plan to protect and enhance ecological diversity and function within a large section of Santa Clara County, while allowing for currently planned development and growth.
- Providing a framework for the protection of natural resources while streamlining and improving the environmental permitting process for both private and public development, including activities such as road, water, and other infrastructure construction and maintenance work.
- Providing environmental benefit resulting in the creation of a number of new habitat reserves larger in scale and more ecologically valuable than the fragmented, piecemeal habitats yielded by mitigating projects on an individual basis,

The San José 2040 General Plan further contemplates the adoption of the Habitat Plan and includes specific strategies to further the goals of the Habitat Plan by:

- Shaping growth in the City to minimize impacts on resource consumption, reduce contribution to global warming, and to preserve and enhance its natural environment (pp. 1-22, Major Strategy #7 – Measurable Sustainability/Environmental Stewardship.)
- Implementing the Habitat Plan to mitigate for land and stream development impacts and provide additional conservation, restoration, and enhancement efforts (pp. 3-27, ER-1.8).
- Ensuring that new public and private development adjacent to riparian corridors in San José are consistent with the Habitat Plan (pp. 3-27, 28).
- Locating trail right-of-ways consistent with the provisions of the Habitat Plan (pp. 4-54 PR-7.2).

- Including public and private habitat conservation as an authorized land use in the “Open Hillside” land use designation (pp. 5-18).
- Considering habitat conservation objectives as part of hillside development proposals (pp. 6-28, LU-17.7).
- Retaining the City’s urban growth boundary to limit urban development in order to, among other purposes, preserve as open space substantial areas of surrounding hillsides, baylands, and other lands to conserve natural resources (pp. 6-29-35, “Land Use Policies – Non-Urban Areas”).

## Unincorporated Areas of Santa Clara County

Approximately 77% of the study area—398,250 acres—is in unincorporated areas of Santa Clara County. Existing development within the unincorporated area is concentrated in the small community of San Martin, located between Morgan Hill and Gilroy, and in the foothills adjacent to either side of the Santa Clara Valley. Other unincorporated communities and development areas in the County include New Almaden in San José’s South Almaden Valley urban reserve, Paradise Valley at the east end of Chesbro Reservoir, and along SR 152. In addition, small “pockets” of unincorporated urban areas exist within the urban service areas of San José and to a smaller extent, Morgan Hill and Gilroy.

Most of the County’s cultivated agricultural land is located along the floor of the South Valley, outside of the urbanized areas. Economically, agriculture is a small component of the County’s economy. The importance of agriculture relates primarily to the amount of land used for agricultural activities. Currently in Santa Clara County, approximately 20,900 acres are in irrigated agriculture; 87% of this agriculture is in unincorporated areas of the County, while 13% is in incorporated areas. Nearly all of this land is within the Plan study area. In addition to irrigated land, significant parts of the study area have historically been grazed by cattle and managed by ranchers. Cattle ranching continues over much of the lands in the study area, including on some public lands.

While some agriculture is located within cities, the majority of agricultural areas are located in the unincorporated County. Existing agricultural uses include bushberries and strawberries, field crops, floral crops (e.g., cut flowers), forest products, fruits and nuts (including grapes for wine making), livestock and poultry, milk and eggs, nursery crops, seed crops, and vegetable crops (County of Santa Clara, Division of Agriculture 2005). Range that is grazed constitutes the largest agricultural use. The Santa Clara County Division of Agriculture provides annual reports on the amount of acreage annually used for agriculture as well as the value of each crop in the County. Crops vary from year to year with the level at which a given crop is produced influenced by the annual value of the crop.

Ranchland and woodland land uses comprise a significant portion of the unincorporated portion of the County (approximately 49% of the entire County). Rangeland is generally located in the hills east and west of developed areas of the North and South Valleys.

The County of Santa Clara regulates land development within unincorporated areas (i.e., those areas in the County not under jurisdiction of any city). The County has not adopted any growth boundaries within its jurisdiction (R. Aggarwal pers. comm.). However, it does have policies and zoning which restrict denser development in the unincorporated areas (see *Conservation and Open Space Policies* section below).

## Population, Housing, and Employment

The population of the unincorporated areas of the County was 15,400 people in 2005 and is projected to reach 16,600 in 2020 and 16,900 in 2030, an increase of 8% and 10% over 2005 values, respectively.

Households in the unincorporated County numbered 5,260 in 2005. The number of households is projected to reach 5,500 in 2020 and 5,600 in 2030, an increase of 5% and 6% over 2005 values, respectively.

Jobs in the unincorporated County numbered 2,590, or 0.2% of jobs Countywide, in 2005. The number of jobs is projected to reach 3,120 in 2020 and 3,180 in 2030, 0.3% and 0.2% of projected jobs Countywide, respectively (Association of Bay Area Governments 2005).

## Conservation and Open Space Policies

The County developed its current general plan in 1995 and updated it in 2001. The County of Santa Clara, Parks and Recreation Department (County Parks) developed the *Strategic Plan for the Santa Clara County Parks and Recreation System* (County Parks Strategic Plan) in 2003 (County of Santa Clara, Parks and Recreation Department 2003). A selection of general plan and County Park Strategic Plan policies related to conservation and open space is listed below (County of Santa Clara 1994; County of Santa Clara, Parks and Recreation Department 2003).

### County General Plan

**R-PR 3<sup>2</sup>.** The County's regional park system should:

- a. utilize the county's finest natural resources in meeting park and open space needs; and
- b. provide a balance of types of regional parks with a balanced geographical distribution.

**R-RC 37.** Lands near creeks, streams, and freshwater marshes shall be considered to be in a protected buffer area, consisting of the following:

- 1. 150 feet from the top bank on both sides where the creek or stream is predominantly in its natural state;

<sup>2</sup> Policy labels are from the County or city document in which the policy is identified.

**2.** 100 feet from the top bank on both sides of the waterway where the creek or stream has had major alterations; and

**3.** In the case that neither (1) nor (2) are applicable, an area sufficient to protect the stream environment from adverse impacts of adjacent development, including impacts upon habitat, from sedimentation, biochemical, thermal and aesthetic impacts.

**R-RC 38.** Within the aforementioned buffer areas, the following restrictions and requirements shall apply to public projects, residential subdivisions, and other private non-residential development:

**a.** No building, structure or parking lots are allowed, exceptions being those minor structures required as part of flood control projects.

**b.** No despoiling or polluting actions shall be allowed, including grubbing, clearing, unrestricted grazing, tree cutting, grading, or debris or organic waste disposal, except for actions such as those necessary for fire suppression, maintenance of flood control channels, or removal of dead or diseased vegetation, so long as it will not adversely impact habitat value.

**c.** Endangered plant and animal species shall be protected within the area.

**R-RC 47.** Impacts from new development on woodland habitats should be minimized by encouraging:

**a.** clustering of development to avoid critical habitat areas, where clustering is permitted;

**b.** inclusion of important habitat within open space areas for project requiring open space dedication;

**c.** siting and design of roads, utility corridors and other infrastructure to avoid fragmentation of habitat; and

**d.** acquisition or avoidance of critical habitat areas.

**R-RC 95.** The scenic and aesthetic qualities of both the natural and built environments should be preserved and enhanced for their importance to the overall quality of life for Santa Clara County.

**R-RC 96.** The general approach to scenic resource preservation for the rural unincorporated areas consists of the following strategies:

**1.** Minimize scenic impacts in rural areas through control of allowable development densities.

**2.** Limit development impacts on highly significant scenic resources, such as, ridgelines, prominent hillsides, streams, transportation corridors and county entranceways.

**R-LU 25.** Non-residential land uses allowed in 'Hillsides' areas shall be of a generally low density or low intensity nature, depending on the use, as is consistent with the basic intent of the Hillsides designation to preserve the resources and rural character of the land.

**R-LU 59.** Residential development may be clustered, provided that the open space portions of the development are protected as permanent open space.

**R-LU 20.** Proposed cluster residential developments shall adhere to the following:

- 2. Open Space:** it is mandatory that no less than 90% of the land area shall be preserved permanently as open space through dedication of an open space or conservation easement precluding any future development:
  - a.** those portions of the land permanently preserved as open space shall be configured as large, contiguous and usable areas;
  - b.** the open space may be dedicated through easements over portions of individually-owned parcels or may be configured as separate parcels owned in common or individually;
  - c.** the open space area shall be privately controlled and not accessible to the public unless the area is deeded to a public agency or entity willing to undertake responsibilities of ownership, maintenance, and public access [designated trail corridors may traverse such areas if proposed as part of the Regional Parks, Trails, and Scenic Highways Plan]; and
  - d.** land uses allowed within the area dedicated as permanent open space shall be limited to agricultural or other limited resource-related uses, and to non-commercial recreational facilities of an ancillary nature to the cluster residential development and for use by residents only.

### County Parks Strategic Plan

**Strategy #1.1.1:** Acquire New Parks – New regional park acquisitions should be considered on lands that:

- expand the boundaries of existing parks or connect these areas;
- provide parks in underserved areas; and
- conserve representative diverse natural landscapes and historic resources of the County.

**Strategy #4.1.1:** A regional parks and trails system should be designed that is consistent with the County General Plan and other County policies associated with protecting and enhancing natural resources, including but not limited to: rich biological habitat areas including wetlands, baylands, and riparian areas; areas of serpentine geology; natural, cultural, and historic areas; and other significant natural features.

**Strategy #4.1.2:** Park and trail use levels and a monitoring system should be developed to ensure recreation and biological resources are balanced in a manner that protects resource qualities.

**Strategy #4.1.3:** Recreational uses and facilities should be planned and located on suitable lands to avoid impacts to rich biological habitat areas.

**Strategy #4.1.4:** When park development might impact natural areas, appropriate mitigation to enhance/improve the habitat values should be employed.

**Strategy #4.3.1:** Natural habitat areas in the County Parks should be enhanced through active stewardship programs and using best management practices (BMPs) based on the most current, reliable scientific information available.

## San Martin Planning Area

San Martin is an approximately 12.3-square-mile unincorporated community located between the sphere of influence lines of the cities of Morgan Hill and Gilroy. San Martin is a rural residential community built around a village dating back to the early 1900s. This community, surrounded by farms, orchards and ranchlands, retains a pastoral rural character (County of Santa Clara 1994). As of the 2000 census, San Martin had a total population of 4,230 (U.S. Census Bureau 2006).

The Santa Clara County General Plan anticipates that this area will remain rural residential. However, there is concern within the San Martin community that local land use control will be diminished as housing pressure for the growing County population increases.

### Relevant General Plan Policies for San Martin

**R-LU 114.** San Martin should be viewed as a distinct entity, containing unique rural characteristics. Care should be taken to prevent premature commitment of land for uses that would restrict future options for the community.

## Santa Clara Valley Water District

SCVWD is the primary water resource agency for Santa Clara County (Santa Clara Valley Water District 2006), providing water to the residents and businesses of Santa Clara County as a water wholesaler and managing local groundwater. SCVWD is also a flood-protection agency and is the main steward for urban streams and creeks in the County and its underground aquifers. Stewardship activities include creek restoration and wildlife habitat projects, pollution prevention, and a commitment to natural flood protection (Santa Clara Valley Water District 2006).

The mission of SCVWD is to maintain “a healthy, safe, and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective, and environmentally sensitive manner” (Santa Clara Valley Water District 2006). This mission reflects the current approach to water management utilized by SCVWD that balances water supply, flood protection, and environmental sensitivity. SCVWD has developed several programs including the Stream Maintenance Program and Watershed Stewardship Program that also reflect this management approach.

There are 768 miles of creeks with watersheds greater than 320 acres. SCVWD owns 178 miles or 26% of these creeks; other public agencies own 87 miles or 19% of the creeks; private owners own 400 miles or 52% of the creeks and the remaining 46 miles or 6% of the creeks are owned by unidentified entities. SCVWD holds easements on approximately 100 miles of creeks which are owned in fee title by others.

SCVWD is a conjunctive-use agency. Conjunctive use is a system of water supply management that utilizes both aboveground (reservoir) and below-ground (aquifer) storage facilities to ensure water supply reliability. Conjunctive use typically entails reservoir or pipeline releases to groundwater recharge ponds—which are either on-channel (i.e., in a natural stream bed) or off-channel—where water percolates into an aquifer and is stored for later extraction. Water stored this way may be rainfall collected in the reservoirs in the County, or reclaimed water. In addition to local water resources, SCVWD also imports water from the State Water Project and the Central Valley Pipeline. SCVWD’s conjunctive use strategy involves managing the available water supplies and the water supply system to:

- meet on-going demand for water from a variety of local and imported sources;
- fill reservoirs in the wet season; and
- transfer water from reservoirs to underground storage in the dry season, making room in the reservoirs for the next wet season.

In order to ensure water will always be available to meet flow requirements and water supply needs, SCVWD utilizes a network of reservoirs, pipelines, and canals to transfer water into the county and also between watersheds within the study area. Imported water (State Water Project and Central Valley Project) enters the county via pipelines and is either deposited in reservoirs, recharge ponds, canals, or into local stream channels. Water transfers between reservoirs are facilitated by pipelines and canals. The canals were built to transport water between creek systems, from creeks to percolation ponds, and to generally support the management of water supply resources in the Valley. They also assist with stormwater management, helping to drain high flows. Water extracted from the system for use is directed to water treatment plants via pipelines and pumping stations.

Operating such a system requires detailed timing of flow releases from reservoirs, management of imported water, operation of in-channel facilities and canals, operation of pumping stations, and maintenance of the infrastructure required to support the system. It also requires maintenance of a complex system of water supply pipelines, canals, dams, reservoirs, pumping stations, diversions, drop structures, streamflow gauges, fish ladders, fish screens, water treatment plants, canals, and associated facilities. An overview of SCVWD water conveyance, treatment, and distribution system is shown in **Figure 2-1**.

SCVWD owns and operates ten reservoirs, with a main function of providing water supply and a secondary function of providing flood control. The reservoirs

also serve a tertiary need for recreation. Only one reservoir, Chesbro Reservoir, was designed as a multipurpose facility with a dedicated flood-storage level and an outlet that can significantly reduce storage in a short time (Santa Clara Valley Water District 2005). Eight of the ten reservoirs are located in the study area: Vasona, Guadalupe, Almaden, Calero, Anderson, Coyote, Chesbro, and Uvas reservoirs (see **Figure 1-2** for a study area map that includes reservoirs). The remaining two reservoirs, Stevens Creek and Lexington Reservoirs, are outside the study area.

SCVWD is responsible for inspection; operations; and maintenance, repair, and replacement of facilities on properties it owns or for which it holds an easement. SCVWD is also responsible for operations and maintenance of the San Felipe Division facilities that are owned by the Bureau of Reclamation. These properties and easements account for approximately 35% of the total creek and canal length in the county, including the Coyote, Almaden-Calero, and Coyote-Alamitos canals and the Coyote canal extension.

## Factors Affecting Conjunctive Use Operations

Factors influencing how water supply is managed vary over time and by site, depending on the time of year, availability of water supply from outside sources, SCVWD's legally defined rights to water supplies from each source, conditions at each site, the local demand for water, and the condition and operability of SCVWD facilities. Factors that affect reservoir operation include water rights, water contracts, safety, recharge and fish flows, facility maintenance, climactic variation, and the California Division of Safety of Dams (DSOD) interim storage or other restrictions. Each of these factors is described below. Conjunctive use operations are affected by the factors described below.

### Water Rights

SCVWD holds water right licenses and a permit from the State Water Resources Control Board to appropriate a specified maximum volume of water for storage in any given year. In terms of on-the-ground operations, the right to appropriate water at a reservoir is effectively the right to divert or capture this water behind the dam and store it to provide for some beneficial use. These diversions are generally limited to the wet season, generally defined as October 1 through April 30. However the authorized diversion period for each water right varies. During periods when SCVWD does not have authorization to divert at the reservoirs (generally May 1 through October 30), SCVWD must release flow at the rate of inflow to the reservoir. For example, if inflow to a reservoir outside of the authorized diversion period is two cubic feet per second (cfs), then SCVWD must release at least 2 cfs, and it cannot divert this flow downstream. However, if SCVWD releases water from storage, that is water in excess of the natural inflow, SCVWD may release that water for recharge, either in-stream or by diversion to off-stream facilities, or release the water for other SCVWD purposes.

SCVWD has water rights to divert natural inflow at the site of its off-channel recharge facilities. These rights specify a total annual volume that may be



diverted and a diversion period. In addition to limitations imposed on SCVWD's diversions to storage imposed by its water rights and the design of diversion dams, diversions are also governed by the capacity of fish screens, CDFG bypass flow requirements, and placement of flashboards.

### **Water Contracts**

SCVWD has two primary water supply contracts: one with DWR for 100,000 acre-feet from the State Water Project and one with the Bureau of Reclamation for 152,500 acre-feet from the Central Valley Project. The combined water supply contracts provide a total of 252,500 acre-feet to SCVWD annually. Both contract supplies are subject to annual shortages, and both provide access in wet years to additional temporary deliveries. To improve long-term reliability, SCVWD also has a contract with Semitropic Water Storage District (Semitropic) for 350,000 acre-feet of banking capacity, and enters into a variety of imported water management contracts, including annual, short-term, and long-term water exchange, transfer, sale, conveyance, and management agreements with various parties. New contracts and contract renewals and amendments are for the purpose of improved reliability and, when combined with the allocation under each of the Central Valley Project and State Water Project contracts, would not exceed a maximum annual delivery of 252,500 acre-feet to Santa Clara County over the course of the permit term of this Plan. Because the amount of imported water is not anticipated to increase over existing planned water imports, and population growth according to existing general plans is covered (described in Section 2.3.2 *Urban Development*), this Plan covers any direct, indirect, cumulative, or growth-inducing effects of delivering and utilizing imported water under existing and future contracts if the amounts and points of delivery remain as projected.

Delivery of imported water by the Department of Water Resources and the Bureau of Reclamation to SCVWD's service area and contract renewal between SCVWD and the Bureau of Reclamation is not a covered activity under this Plan. However, this Plan does cover the reconstruction of facilities located within the permit area (described below in Section 2.3.3 *In-Stream Capital Projects* and Section 2.3.5 *Rural Capital Projects*) required to transport imported water throughout the study area (e.g., reservoirs, canals, groundwater recharge ponds), and the operation and maintenance of facilities located within the permit area (described in this section and in Section 2.3.6 *Rural Operations and Maintenance*) required to manage water supply (e.g., Dam Maintenance Program, reservoir operations, recharge operations, Pipeline Maintenance Program).

### **Safety**

Reservoirs also function to reduce the potential for very large storms to cause flooding, and operators may slow down the rate of reservoir filling or make post-storm releases to avoid having a full reservoir too early in the wet season. To the extent that it is feasible, SCVWD operates to ensure that there is appropriate "space" in the reservoir to store anticipated storm flows and monitors weather on an on-going basis; releases may be made prior to a storm if needed to ensure adequate storage space. Following a storm, SCVWD may make additional releases to restore needed space for subsequent storm flows. As a result,

reservoir operations in the wet season are not characterized by a steady increase in storage, but by episodes of storage and release of water, with a general trend towards increasing the volume of water stored as the wet season progresses.

### **Fish Flows**

SCVWD maintains flow in the channels using local and imported water supplies to maintain fish and wildlife habitat below the dams. In order to benefit the fisheries within the watersheds in which SCVWD's conjunctive use water supply operations take place, SCVWD may re-operate its conjunctive use operations (i.e., alter how conjunctive use operations are currently managed in order to further enhance fish habitat). This re-operation is described in this chapter under the *Proposed Three Creeks HCP Conservation Program Operations and Maintenance Actions* and *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds*. Such re-operation may alter the existing pattern of storage and recharge which may result in take of covered amphibians and reptiles.

SCVWD will not re-operate its conjunctive use operations until it receives authorization from NMFS and CDFG. In the proposed Three Creeks HCP study area this will be accomplished through the Three Creeks HCP. In the Uvas and Llagas watersheds, this may be accomplished through an informal consultation with NMFS and CDFG, a new HCP process, or through formal consultation with NMFS pursuant to Section 7 of the ESA.

### **Facility Maintenance**

Facility maintenance may require SCVWD to reduce reservoir releases temporarily. For example, recharge basins may require cleaning, and SCVWD would reduce diversions accordingly. At the dam, valves may need routine calibration and maintenance, resulting in short-term reductions in releases.

### **Climate Variation**

Groundwater recharge is possible in all seasons because of the intermittent nature of precipitation and inflow to the study area watersheds. For example, there are many times in a typical wet season when natural flow is minimal and SCVWD makes releases from reservoirs and other facilities to maintain a wetted channel and to provide for off-channel recharge. In addition to intra-annual variation in conditions, conjunctive use operations also respond to year-to-year conditions. In dry years, initial wet-season storage may be quite low, resulting in an initial period of limited releases as storage reaches the baseline values for seasonal storage. When this occurs, a more normal pattern of storage and release is implemented.

### **Flood Management**

In addition, the SCVWD will continue to operate its reservoirs to provide for safe conditions for downstream communities. This involves managing reservoir storage to ensure that there is adequate capacity to contain high levels of projected inflow during storm events. Reservoirs capture flood flows from the upper watershed and protect downstream reaches from overbanking. When a large storm is predicted, reservoir storage is drawn down to a level that allows room to capture upstream flood flows. SCVWD developed probability flood

curves which are used to determine how much flood storage room should be freed up. Prior to a major storm, SCVWD may increase releases to provide for storage adequate to prevent flooding, followed by a shift to reduce releases when the threat of flooding has passed.

## Water Resources Protection Ordinance

In October 2006, SCVWD enacted the Water Resources Protection Ordinance. This ordinance established the regulations by which, beginning on February 28, 2007, SCVWD issues permits for modifications, entry, use, or access to SCVWD facilities with the approval and enactment of ordinance O6-1, and where SCVWD has either a fee title or easement property right. This ordinance was developed and enacted to codify the Water Resources Protection Ordinance: Guidelines and Standards for Land Use Near Streams developed by the Santa Clara Valley Water Resources Protection Collaborative<sup>3</sup> (Collaborative).

The Collaborative was formed in 2003 to address the needs of flood management, drinking water quality and quantity, surface and groundwater quality and quantity, and habitat protection and enhancement throughout the county (Santa Clara Valley Water District 2006). With the enactment of these measures, SCVWD, the cities, and the County are better equipped to protect the integrity of streams in the context of the goals of cleaner, healthier, and more sustainable water resources.

Other agencies do not comply directly with ordinance O6-1, but instead can adopt the guidelines of O6-1 or determine that existing zoning code and/or policies fulfill the guidelines. San José and the County approved resolutions, finding that their existing codes comply with the guidelines, Morgan Hill adopted the guidelines, and Gilroy added a new Water Resources Protection chapter to its zoning code, thereby incorporating the guidelines. An encroachment permit is required for all projects that modify, enter, use, or access SCVWD lands and/or easements. It is through the administration and issuance of the encroachment permit that the guidelines and standard are enforced and tracked.

The issuance of the encroachment permit is subject to an environmental assessment and must be found to be in compliance with CEQA. In addition, a number of findings must be made, including, but not limited to, that the proposed modifications will not impede, restrict, slow down, pollute, change the direction of water flow, catch or collect debris carried by the water, and banks will not be damaged, weaken, eroded, increase siltation, be reduced in their effectiveness to withhold storm and flood waters.

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<sup>3</sup> The Santa Clara Valley Water Resources Protection Collaborative is formed by several member agencies and private community members including SCVWD, the County of Santa Clara, all of the cities and towns within Santa Clara County.

## **Santa Clara Valley Transportation Authority**

The VTA is an independent special district responsible for bus and light rail operations, congestion management, specific highway improvement projects, and Countywide transportation planning. As such, VTA is both a transit provider and a multi-modal transportation planning organization involved with transit, highways and roadways, bikeways, and pedestrian facilities (Santa Clara Valley Transportation Authority 2006).

The mission of VTA is to provide “sustainable, accessible, community-focused, transportation options that are innovative, environmentally responsible, and promote the vitality of our region” (Santa Clara Valley Transportation Authority 2008).

The responsibilities of VTA include transit service, transit planning, highway planning, commuter train service (Caltrain), the Congestion Management Program, and regional transit partnerships. VTA is primarily a funding agency for local transportation and related projects such as bikeways.

VTA often partners or works in conjunction with other agencies and jurisdictions. A manifestation of this is apparent in the Valley Transportation Plan 2035 (VTP 2035) recently completed by VTA (Santa Clara Valley Transportation Authority 2009). This document contains hundreds of projects submitted to VTA by cities in Santa Clara County and by the County. Although these projects are spearheaded by the jurisdiction, the VTP 2035 helps the jurisdictions present the projects as part of a long-range planning package, as well as seek funding sources for the projects. Almost all projects in the VTP 2035 are projects that VTA will implement with other local or state agency partners.

### **2.2.2 Land Use Categories**

Understanding the future land use in the Plan study area is an important step in developing the impact analysis for covered activities in Chapter 4. The adopted general plans for the cities of Gilroy, Morgan Hill and San José and Santa Clara County were used to identify future extent and location of urban and rural development in the study area that could be covered by the Plan. General plan land use designations and discussions with the participating jurisdictions were used to refine the land use assumptions for the areas that are designated to become urban.

General plan land-use designations vary across jurisdictions and are generally in more categories than necessary for the Plan, so they need to be simplified and standardized. The process by which a land use map was developed and how land use categories for the Plan were assigned is described below.

## Methodology for Developing the Land Use Categories Map

Land-use designations for Santa Clara County and Cities of Gilroy, Morgan Hill, and San José were used to develop a single land use map for the Plan. Future land uses were assumed to be consistent with the general plans of the County (2001), City of Gilroy (2002a, 2002b), City of Morgan Hill (2006), City of San José (2006a, 2011), and the City of Gilroy Hecker Pass Specific Plan (City of Gilroy 2005b). The County of Santa Clara general plan projects future land use to 2010, the Gilroy general plan projects future land use to 2020, the Morgan Hill general plan includes growth and development management measures that extend to 2025, and the San José general plan projects land use to 2040. Using these projections for this Plan with a significantly longer time horizon is regarded as appropriate given the strength of each jurisdiction's commitment to constraining future growth within established urban growth boundaries (see discussion above under *Existing Conditions*).

Over 80 land-use designations from the four jurisdictions were aggregated into the following six categories.

- Urban Development.
- Rural Residential.
- Ranchland/Woodland.
- Agriculture.
- Urban Parks and Open Space.
- Rural Parks and Open Space.

Development of these six categories was guided by the nature of the covered activities within each land use category and their relative impact on biological resources. For example, the many urban land use categories (e.g., residential, commercial, industrial) were combined into a single land use category for this Plan because they all result in similar effects on biological resources. **Table 2-1** shows general plan land uses and the Plan land use categories to which they were converted.

Most of the jurisdictional land-use designations translate in their entirety to a Plan land use category. One exception, however, is parks and open space designations in each city. Some city parks are large, located on the urban fringe, and may function well as habitat for covered species or as a part of a movement corridor. In these cases, the park was designated as Rural Parks and Open Space. Therefore, city designations for parks and open space will be individually considered and certain sites will be categorized as Rural Parks and Open Space.

## Plan Land Use Categories

**Figure 2-2** shows the Plan land use categories in the study area. This map depicts development land use designations that include both developed and undeveloped areas (for actual land *cover*, see Chapter 3).

The Urban Development land use category includes residential densities greater than 1 dwelling unit per 2.5 acres, as well as all industrial, commercial, institutional, public facilities, public/quasi-public, and major educational facilities land-use designations. The study area is 519,506 acres of which 100,143 acres (19%) are categorized as Urban Development.

The Rural Residential category includes low-density residential development density of 1 dwelling unit per 2.6 to 20 acres. Rural residential lands tend to be located in the unincorporated areas of the County; however, each of the three cities covered by the Plan also maintain land use densities that correspond to the Plan's Rural Residential category. The Rural Residential land use category comprises 13,141 acres (3%) of the study area.

The Ranchland/Woodland category includes rural lands with a development density of 1 dwelling unit per 20.1 to 160 acres. This category is comprised of all lands not otherwise designated. It includes open lands common in the western slopes of the Diablo Range as well as the woodlands common to the eastern slopes of the Santa Cruz Mountains. According to the County general plan, ranchlands are defined as "lands predominantly used as ranches in rural unincorporated areas of the County, remote from urbanized areas and generally less accessible than other mountain lands." The Ranchland/Woodland land use category comprises 253,098 acres (49%) of the study area.

County lands designated as Agriculture may be used for: "agriculture and ancillary uses; uses necessary to directly support local agriculture; and other uses compatible with agriculture which clearly enhance the long term viability of local agriculture and agricultural lands" (County of Santa Clara 1994). In addition to the County, the City of Gilroy supports some agriculture in the Hecker Pass Special Use District and Specific Plan. Agriculture in this area includes low intensity crops such as vineyards, orchards, and some row crops (City of Gilroy 2005b). For this Plan, land uses identified by the Hecker Pass Specific Plan are incorporated with land-use designations of the City of Gilroy. The Agriculture land use category comprises 23,852 acres (5%) of the study area.

The Plan category of Urban Parks and Open Space includes lands designated by cities or the County for parks and recreation, and for open space that is surrounded by urban development or is itself highly developed or landscaped. These sites are all located within incorporated city limits and are unlikely to be used by any of the species covered by this Plan except along some rivers and creeks. The Urban Parks and Open Space land use category comprises 7,289 acres (1%) of the study area.

The Plan Rural Parks and Open Space category encompasses parks and open space in rural areas, including larger parcels of land located on the urban fringe,

and indicates that the landscape may be used by covered species. This category includes federal land; local, state, and regional parks; private lands that are protected with conservation easements or dedicated development rights, or that are used in a manner that would allow use by covered species (including large golf courses on the urban fringe); and public watershed lands. Some of the sites categorized as Rural Parks and Open Space are expected to be important components of the Plan conservation strategy. The Rural Parks and Open Space land use category comprises 121,072 acres (23%) of the study area.

### 2.2.3 Planning Limits of Urban Growth

Urban development covered by the Plan includes the growth anticipated by approved or drafted general plans at the time of permit issuance. Identifying the extent of expected urbanization within the Plan study area, or the “planning limit of urban growth,” informs the impact analysis and identifies the extent of take coverage for urban development needed under the Plan.

One important factor in identifying the planning limit of urban growth is defining where road projects enter and exit the urbanized area. Road projects outside urban areas are expected to have greater impacts on some covered species than road projects within urban areas, so they may be treated differently by the Plan. The anticipated planning limits of urban growth are discussed for each city under the Existing Conditions section above, are shown in **Figure 2-2**, and are summarized below.

- Gilroy: General Plan Boundary (City of Gilroy 2002a).
- Morgan Hill: Urban Limit Line (adopted April 2006).
- San José: Urban Growth Boundary, also known as the “Greenline” (adopted by voters in 2000).

There are three exceptions to the assumption of full urban development within the planning limits of urban growth over the course of the permit term.

1. The City of San José Coyote Valley Urban Reserve and the South Almaden Valley Urban Reserve.
2. The City of Morgan Hill Southeast Quadrant.
3. The City of Gilroy Hecker Pass Specific Plan (City of Gilroy 2005b).

These three areas are assumed to be developed consistent with rural development land uses and not urban land uses.

The County does not permit urban growth in its jurisdictions except within urban “pockets” of unincorporated lands that occur in small patches within the three cities. The County has identified a general plan Strategy of promoting eventual annexation of these urban pockets to the city in which the pocket is located (County of Santa Clara 1994). Therefore, it is anticipated that all County pockets currently inside a city’s planning limit of urban growth will be incorporated into

a city over the course of the permit term of the Plan. As such, a planning limit of urban growth is not defined for the County in this Plan.

## 2.2.4 Existing Open Space and Parkland

Dating back to the 1970s, the County of Santa Clara, SCVWD, and the cities of Gilroy, Morgan Hill, and San José have had a close connection to the natural landscapes of the Santa Clara Valley and an awareness of the importance of protecting open space. Of the 519,506-acre study area, 151,727 acres (29%) are currently protected as open space of some kind. These areas range from urban parks to County and state parks of varying size. The following section provides an overview of existing open space agencies with holdings in the study area and the major open space units that they operate. Significant open space units in the study area which help support the Plan's conservation strategy are described in **Table 2-2** and shown in **Figure 2-3**.

### United States Bureau of Land Management

The Bureau of Land Management owns several parcels of land in Santa Clara County. Two of those parcels are located within the study area just north of Middle Fork of Coyote Creek, north of Henry W. Coe State Park. The Bureau of Land Management has transferred large parcels of land to California Department of Parks and Recreation (State Parks) to become part of Henry W. Coe State Park. The remaining parcels totaling approximately 1,025 acres are still under the ownership of the Bureau of Land Management, but may be transferred to the park in the future.

### California Department of Parks and Recreation

State Parks owns two large parks that occur, in part, in the study area: Henry W. Coe State Park and Pacheco State Park. State Parks also jointly owns Martial Cottle Park with the County of Santa Clara. Henry W. Coe State Park and Pacheco State Park are discussed below. Martial Cottle Park is discussed under *County of Santa Clara, Parks and Recreation Department*.

#### Henry W. Coe State Park

Henry W. Coe State Park is the largest state park in northern California at 85,843 acres, 58,642 acres of which (68%) are within the study area. The remaining 27,201 acres of the park are in Santa Clara and Stanislaus Counties. Much of the park was originally donated by Sada Coe Robinson to Santa Clara County in 1953, when it became Henry Willard Coe County Park. In 1958, the park was added to the state park system. The park's original size was approximately 13,000 acres. Since the 1980s, the park has expanded



considerably through the purchase of adjacent properties on all sides. The park is still growing.

Elevations in this rugged park range from approximately 1,000 feet to 3,560 feet. The park has a diverse mix of habitat types including grassland, oak woodland, ponderosa pine forest, mixed chaparral, riparian woodland, and over 100 ponds. The park also supports two large man-made lakes, Mississippi Lake and Coit Lake, as well as the headwaters of Coyote Creek and several miles of Pacheco and Orestimba creeks. The 23,300-acre Orestimba Wilderness, a state-designated wilderness area that accounts for approximately 27% of the total acreage of the park, is entirely within Stanislaus County, adjacent to the study area. The park is open year-round for hikers, mountain bikers, backpackers, equestrians, picnickers, and photographers on over 100 miles of trails and roads. Access to the park by car is extremely limited, with only four entrances and paved roads that stop at the margins of the park. The main entrance and park headquarters is approximately 13 miles east of U.S. 101 northeast of Gilroy and accessed via the Dunne Avenue exit from U.S. 101 in Morgan Hill (California Department of Parks and Recreation 2004).

Natural resources management at Henry W. Coe State Park is focused on high-priority threats, such as an overabundance of wild pigs, which can cause considerable damage to wetland and grassland areas. To address this threat, park managers contract with trained hunters to help reduce wild pig populations. Yellow star-thistle and other invasive weeds also present a threat to the native grasslands in the park. Grassland areas are managed through the use of small prescribed burns which reduce the spread of invasive plant species. An important unmet need in park management is maintenance of existing but unused stock ponds that provide important habitat for California red-legged frog and California tiger salamander (A. Palkovic pers. comm.). There is no livestock grazing in the park. Wildfire management is also an issue for the park. In 2007, the Lick fire burned 47,760 acres and resulted in a temporary closure of affected areas in the park. Currently there are fewer than three full-time staff devoted to this park. Staff and budget limitations severely constrain State Park's ability to conduct extensive habitat and species management in this large park.

## **Pacheco State Park**

Pacheco State Park came into existence through a donation in 1992 by Paula Fatjo, a direct descendant of Francisco Pacheco for whom the Pacheco Pass is named. Visitors on the park's trails enjoy views of the San Luis Reservoir and the San Joaquin Valley to the east and views of the Santa Clara Valley to the west. The park supports rolling hills of mostly grassland and oak woodland habitats. Approximately 734 acres of the 6,921-acre park are within the study area. The remaining 6,187 acres are in adjacent Merced County. The western 2,600 acres of the park (including the portion in Santa Clara County) are open to the public (California Department of Parks and Recreation 2004).

## California Department of Fish and Game

The CDFG owns the Cañada de los Osos Ecological Area, formerly the Stevenson Ranch, located on Jamieson Road, about ten miles east of Gilroy. The CDFG purchased the 4,400-acre ranch in 2001 with the assistance of The Nature Conservancy. Two hundred acres of the property were sold to the State Parks as a trailhead into Henry W. Coe State Park. The remaining 4,200 acres are managed by the CDFG in cooperation with the California Deer Association for youth outdoor education programs and the improvement of wildlife habitat on the property. A grazing management plan has been developed for this site, although the plan has not been implemented.

## County of Santa Clara, Parks and Recreation Department

The mission of County Parks is to provide, protect and preserve regional parklands for the enjoyment, education and inspiration of this and future generations (County of Santa Clara, Parks and Recreation Department 2003). Since its inception in 1956, County Parks' park system has grown to encompass approximately 45,000<sup>4</sup> acres in 28 park units that provide a variety of urban and rural recreational amenities. For more than four decades, County Parks has focused on purchasing and developing a network of regional parks and trails along the hillsides adjacent to the urban fringe and along the creeks that pass through the urban service area. This "necklace of parks" vision was put into place in the early 1960s and has guided park acquisition and development ever since (County of Santa Clara, Parks and Recreation Department 2003). County Parks balances access and recreation with resource protection. In addition to providing recreation opportunities in the County, County Parks conducts resource preservation, protection, conservation, enhancement, and restoration.

### Strategic Plan

With the goal of accommodating the growing outdoor recreation needs of an increasing urban population, the County Parks Strategic Plan (County of Santa Clara, Parks and Recreation Department 2003) lays out a vision that will allow the system to continue to meet the needs of the County's residents. The vision of the Plan is captured in the following statement.

We create a growing and diverse system of regional parks, trails, and open spaces of Countywide significance that connects people with the natural environment, offers visitor experiences that renew the human spirit, and balances recreation opportunities with resource protection (County of Santa Clara, Parks and Recreation Department 2003).

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<sup>4</sup> While County Parks manages all 45,000 acres for recreation, approximately 5,000 of the 45,000 acres are owned by SCVWD.

The County Parks Strategic Plan focuses on the balance of recreation and natural resource protection, guiding the improvement and expansion of the County park and countywide trail system to meet the growing demand for high-quality recreational opportunities in Santa Clara County while also supporting and protecting local natural resources (County of Santa Clara, Parks and Recreation Department 2003).

## **Countywide Trails Master Plan**

The Santa Clara County Countywide Trails Master Plan Update, an update to the 1980 County General Plan Trails element, was completed in November 1995 by the County of Santa Clara, Parks and Recreation Department. The Board of Supervisors adopted the updated trail policies and trails map as an amendment to the County General Plan. This update provides a vision for a network of contiguous trails that connects County parks, open space areas and other trails systems with northern and southern urbanized areas. As part of the update, the countywide trails policies and design guidelines were updated and developed to guide continued planning, define a process for implementing trails and coordinating with private property owners, establishing priorities, mitigating environmental impacts, and directing trail use, design, operations, and management (County of Santa Clara, Parks and Recreation Department 1995).

## **Natural Resources Management**

County Parks maintains a small but active natural resources management program guided by the County Parks Strategic Plan and natural resources management guidelines (County of Santa Clara, Parks and Recreation Department 2004). The Natural Resources Management Program is comprised of four full-time staff for the entire County park system. Management or restoration projects are often implemented by natural resource staff, park maintenance staff, park rangers or contractors.

County Parks is in the process of developing comprehensive natural resource management plans for all of its park units and grazing management plans for some of its park units. The Ed R. Levin, Joseph D. Grant, and Coyote Lake-Harvey Bear Ranch County parks were the first County parks for which County Parks developed formal natural resource management plans in the study area. The Coyote Creek Parkway Integrated Master Plan (a combined natural resource management plan and master plan) was adopted in March 2007 (County of Santa Clara, Parks and Recreation Department 2006a). Interim natural resource management plans have been completed for most of the parks.

The current focus of the natural resources management program is conducting system-wide assessments of resources within the parks to identify and prioritize management actions. Site-specific management projects have been limited due to funding and staffing constraints and the need for management plans. Recent projects and programs have included riparian enhancement, invasive weed

control, oak woodland enhancement programs, vegetation management projects and programs, grassland enhancements, wildlife enhancements throughout the park system, livestock grazing programs, wetland restoration, and prescribed burns. Many of these actions have taken place at Joseph D. Grant County Park.

In 2004 a Grazing Management Plan was completed for Calero/Canada del Oro to address Bay checkerspot butterfly mitigation and habitat enhancement. In 2011 County Parks completed a Grazing Management Plan for Santa Teresa County Park to address management of annual grasslands and oak woodlands for the benefit of native species, management of wildfire risks, control of non-native plant species, while addressing continuing public access to these special areas. This Grazing Management Plan is in response to the need to manage serpentine grassland habitats as well as the implementation of the USFWS's *Recovery Plan for Serpentine Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). Through federal grant funding assistance from the USFWS and the Bureau of Reclamation, County Parks will be implementing the goals of the Grazing Management Plan to return cattle to the park in order to manage the serpentine grassland habitats.

## Major County Parks

Several large regional parks within the study area are owned and/or managed by County Parks. Collectively, these parks are representative of the diverse resources available in Santa Clara County and support a variety of recreational interests including hiking, mountain bicycling, horseback riding, picnicking, golf, archery, hang gliding, model aircraft areas, dog parks, boating, water skiing, fishing, camping, velodrome races, and natural and cultural interpretation. A brief discussion of County parks that may contribute to the Plan conservation strategy is included below and summarized in **Table 2-2** (also see **Figure 2-3** for map of open space in the study area, including County parks).

### Almaden Quicksilver County Park

Almaden Quicksilver County Park is located on the western border of the study area, surrounding much of Guadalupe and Almaden Reservoirs. The park was historically used for mining activities and was once home to more than 1,800 miners and their families. The park encompasses 4,152 acres, occupying a majority of Capitancillos Ridge. The park is known for its early spring wildflowers and history surrounding the late 19<sup>th</sup> century mining era.

The park provides over 34 miles of hiking trails, including 23 miles of equestrian trails and 10 miles of bike trails. All trails in the park are open to hikers with pets to walk their dogs on leash (County of Santa Clara, Parks and Recreation Department 2006b).

### Anderson Lake County Park

Anderson Lake County Park is located in the foothills of the Diablo Range east of Morgan Hill and almost entirely (except in the northeast) surrounds Anderson Reservoir, the largest reservoir in Santa Clara County. The 3,144-acre park incorporates other parks including segments of the Coyote Creek Parkway

multiple use trails, the historic Jackson Ranch, the Moses L. Rosendin area, and the Burnett area (County of Santa Clara, Parks and Recreation Department 2006b).

### **Calero County Park**

Calero County Park is located in the eastern foothills of the Santa Cruz Mountains, south San José. The approximately 4,455-acre park offers picnicking, boating and fishing on Calero Reservoir and 18.6 miles of trails in the adjoining oak woodlands. The park contains a trails staging area at the Park office near McKean Road. Additional access is available from the Santa Clara County Open Space Authority (Open Space Authority) Rancho Canada del Oro staging area on Casa Loma Road. Certain uses, such as equestrian group camping, horse and cart activities and special events are by permit only (County of Santa Clara, Parks and Recreation Department 2012). Portions of this park historically have been grazed (J. Mark pers. comm.)

County Parks is developing a Trails Master Plan for Calero County Park to incorporate the 966-acre Rancho San Vicente property acquired in November 2009 into the park (this parcel is also expected to be enrolled in the Habitat Plan Reserve System; see Chapter 5 for interim conservation actions). The Trails Master Plan will also consider expanding the types of trail uses allowed in the park in accordance with provisions of the *Santa Clara County Parks and Recreation System: Strategic Plan* which states that the purpose of a park-specific Trails Master Plan is “to identify opportunities to increase multiple-use trails and to ensure consistency with the Countywide Trails Master Plan and Strategic Plan” (County of Santa Clara, Parks and Recreation Department 2003).

Portions of this park have been grazed in the past (D. Rocha pers. comm.). A Grazing Management Plan was completed for the Canada del Oro property of Calero County Park in 2004 (County of Santa Clara, Parks and Recreation Department 2011; Rana Creek Habitat Restoration 2004). Infrastructure to support implementation of the Grazing Plan is under development. The Rancho San Vicente property of Calero is currently grazed under a managed grazing program through a grazing license with a private operator (D. Rocha pers. comm.).

### **Coyote Creek Parkway**

Coyote Creek Parkway is a 1,694-acre park that meanders along Coyote Creek for 15 miles, bridging the gap between rural and urban parks along the valley floor within the study area. Coyote Creek Parkway ends at Hellyer County Park to the north and Anderson Lake County Park to the south. The Coyote Creek Trail features a 15-mile, 10-foot wide multi-use paved trail between Hellyer County Park and Anderson Lake County Park. The trail is identified in the Countywide Trails Master Plan as a regional trail (Bay Area Ridge Trail and Juan Bautista de Anza National Historic Trail) and as a subregional trail. The north portion features a paved multi-use trail popular with bicyclists, rollerbladers, and hikers. South of Metcalf Road, an equestrian trail parallels the paved trail (County of Santa Clara, Parks and Recreation Department 2006b).

County Parks is implementing the Coyote Creek Park Integrated Plan which is a combined Natural Resources Management Plan and Master Plan adopted by the County Board of Supervisors in 2007. Please refer to the Covered Activities section of this chapter for more details on the resource management plan and master plan.

### **Coyote Lake-Harvey Bear Ranch County Park**

Coyote Lake-Harvey Bear Ranch County Park is located in the western foothills of the Diablo Range, east of San Martin. This 4,595-acre park encompasses Coyote Lake (Coyote Reservoir), providing opportunities for power boating, jetskiing, waterskiing, sailing, canoeing/kayaking and fishing. The lake contains bluegill, black crappie, channel catfish, carp, and black bass. In spring the lake is stocked with rainbow trout. The Bear and Mendoza Ranch sections of the park provide over 18 miles of hiking, biking and equestrian trails. The park is currently grazed under a managed grazing program (J. Mark pers. comm.). A master plan and natural resource management plan were adopted for this park in 2003 (County of Santa Clara, Parks and Recreation Department 2003; Rana Creek Habitat Restoration 2004).

### **Ed R. Levin County Park**

Ed R. Levin County Park is located in the northern most tip of the study area. This 1,541-acre park combines the traditional features of an urban park with the trail system of a regional park. One of the highest points in the study area, Monument Peak, is located in the park. Hikers, equestrians, and cyclists enjoy sections of the park's 19-mile trail system. The southern portion of the park, known as the Spring Valley Area, is named for the many springs that flow freely in this area (County of Santa Clara, Parks and Recreation Department 2006b). In portions of the park, Ed R. Levin County Park supports cattle grazing which is monitored under a natural resource management plan and managed under grazing program (D. Rocha pers. comm.).

### **Joseph D. Grant County Park**

The 9,560-acre Joseph D. Grant County Park is the largest of Santa Clara County's regional parks. It is located on the eastern border of the study area in the Diablo Range. Cattle grazing is allowed in some parts of the park, managed under a grazing program (D. Rocha pers. comm.) and monitored under a natural resource management plan. Hikers and equestrians have access to an extensive 52 mile trail system. Mountain bikes are permitted on nearly half of the park's trails. The diverse trail system at the park makes this a popular place to stage large-scale organized trail events such as equestrian endurance rides, mountain bike events and foot races (County of Santa Clara, Parks and Recreation Department 2006b).

### **Martial Cottle Park**

In 2004, 151 acres of mostly agricultural lands were donated to the County of Santa Clara and 136 acres were sold to State Parks by the owners for preservation as a historic agricultural park. The property is located in the city limits of San José but outside of San José's planning limit of urban growth. This park is entirely surrounded by suburban development but retains some habitat value in its undeveloped state, particularly for western burrowing owls (J. Barclay pers.

comm.). While jointly owned by the County and State Parks, County Parks is responsible for the planning, development and long-term management of the park. In 2011 State Parks and County Parks completed a collaborative master planning process to define guidelines and policies for the site's development, management, operations of recreational, educational and agricultural use opportunities. Due to deed restrictions those long term operations will include intensive agricultural practices which will make it less habitable for native species.

### **Motorcycle County Park**

Motorcycle County Park is the County's only off-road vehicle park. This 442-acre park is located in the foothills of the Diablo Range, east of the southern tip of San José, outside of San José's planning limit of urban growth. The park supports 20 miles of dirt trails (County of Santa Clara, Parks and Recreation Department 2006b).

### **Mount Madonna County Park**

This 3,677-acre park is dominated by redwood forests characteristic of the Santa Cruz Mountains. To the east, the park overlooks the Valley; to the west, Monterey Bay. As the slopes of Mount Madonna descend toward the valley, the landscape changes from redwood forest to oak woodland, dense chaparral and grassy meadows. Hikers and equestrians have access to an extensive 20-mile trail system.

### **Santa Teresa County Park**

Santa Teresa County Park is located in the Santa Teresa Hills ten miles south of downtown San José. This diverse 1,646-acre park offers a variety of recreational opportunities including golf, archery range, an equestrian staging area, and picnic sites for large groups. Additionally, the park offers over 18 miles of unpaved trails for equestrian, hiking and bicycle use, as well as historic resources and interpretive sites. County Parks completed a Grazing Management Plan for the park in 2011; grazing will take place once infrastructure upgrades are completed (D. Rocha pers. comm.). The Coyote Alamos Canal, a facility owned and operated by SCVWD, crosses through the park (County of Santa Clara, Parks and Recreation Department 2006b).

### **Uvas Canyon County Park**

Uvas Canyon County Park is located in the Santa Cruz Mountains, west of Morgan Hill and San Martin, adjacent to Uvas Reservoir. This wooded 1,133-acre park offers hiking, camping, and picnicking opportunities throughout most of the year. The park has seven miles of hiking trails.

### **Uvas Reservoir County Park**

Uvas Reservoir County Park is located in the Santa Cruz Mountains, west of Morgan Hill and San Martin. This park is 626-acre, including the 286-acre reservoir, and is open year round for non-gas powered boating and fishing. No designated trails are available at this park (County of Santa Clara, Parks and Recreation Department 2008).

## **Santa Clara County Open Space Authority**

The Open Space Authority was created on February 1, 1993 by the California State Legislature, in response to efforts by citizens and local governments of Santa Clara County to protect the open spaces that were being threatened by development. The Authority is governed by an elected seven-member board of directors, each representing a unique district. The Authority comprises the cities of Campbell, Milpitas, Morgan Hill, Santa Clara, and San José, as well as much of the unincorporated areas of Santa Clara County. The Open Space Authority's current annual funding is \$4.1 million. The Open Space Authority administers an Urban Open Space Program, which allocates annual funding to the cities within its jurisdiction for open space, habitat and recreational purposes.

The Open Space Authority's Board has defined its purpose as follows.

Preservation of Open Space and creation of greenbelts between communities, lands on the valley floor, hillsides, viewsheds and watersheds, baylands and riparian corridors, are immediate high priorities. These are needed to counter the continuing and serious conversion of these lands to urban uses, to preserve the quality of life in the County and to encourage outdoor recreation and continuing agricultural activities.

Development and implementation of land management policies that provide proper care of open space lands and allow public access appropriate to the nature of the land for recreation are consistent with ecological values and compatible with agricultural uses (Santa Clara County Open Space Authority 2005).

The Open Space Authority operates in approximately the same area as that Plan study area. As of June 2009, the Open Space Authority has preserved 14,494 acres within the study area. Acquisitions have included Rancho Cañada del Oro Open Space Preserve, Sierra Vista Open Space Preserve, and Palassou Ridge Open Space Preserve, which are located in the study area and may contribute to the Plan's conservation strategy (see following discussion below). The Open Space Authority has protected other lands in the Coyote Valley and eastern Diablo Range foothills, as well as agricultural lands located in the southern portion of the county. The Open Space Authority's properties are protected through a combination of conservation easements, fee title purchase, and management agreements (Santa Clara County Open Space Authority 2005). Field staff oversee a wide variety of environmental stewardship, restoration, and monitoring projects. Docents and volunteers provide additional stewardship, interpretation, and outdoor education services.

### **Rancho Cañada del Oro Open Space Preserve**

The 3,602-acre Rancho Cañada del Oro Open Space Preserve is located adjacent to Calero County Park, southwest of San José. Opened in 2004, the facility includes a parking area, restrooms, picnic tables, and an equestrian staging area.



The preserve currently supports more than 13 miles of trails. (Santa Clara County Open Space Authority 2010).

### **Palassou Ridge Open Space Preserve**

The 3,515-acre Palassou Ridge Open Space Preserve (formerly Lakeview Meadows) is located at the eastern edge of Coyote Reservoir, west of Henry W. Coe State Park. This area provides opportunities for preserving uninterrupted habitat corridors and significant riparian and watershed resources between Henry W. Coe State Park and Coyote Lake Harvey Bear Ranch County Park. Trail connections to Henry W. Coe State Park and potentially to the Nature Conservancy lands could provide public access and a component of a future regional trail network.

### **Sierra Vista Open Space Preserve**

The 1,676-acre Sierra Vista Open Space Preserve is located adjacent to Alum Rock Park in the eastern foothills above San José. The preserve encompasses oak woodlands, chaparral, and rolling grasslands, and provides habitat for numerous rare plant and wildlife species. The preserve currently includes more than 10 miles of trails including a portion of the Bay Area Ridge Trail. The Open Space Authority has received grant funding for planning, design, and construction of additional trails and a visitor parking and staging area.

## **City Parks**

Each of the three cities covered by the Plan supports a network of parks and open space. The majority of these parks are managed for intensive recreational use and include such features as athletic facilities, community centers, turf fields, picnic areas, and trails.

Few of the city parks provide important plant or wildlife habitat. One exception is Alum Rock Park in San José. This 740-acre park provides habitat for a variety of wildlife including mountain lions, bobcats, deer, and many small animals. Other city parks that may have important habitat value include Penitencia Creek Park in San José, and Eagle Ridge open space, Uvas Creek Park Preserve, and Christmas Hill Park in Gilroy.

## **Development Mitigation Sites**

All three cities and the county frequently require development projects with significant habitat or scenic resources to set aside a portion of their parcel and dedicate it as permanent open space. In other cases, development projects without enough resources on site are required to conserve land off site. These dedications are often conservation, open space, or scenic easements that are recorded with the property title. Older easements were often dedicated without

any provision for habitat maintenance or monitoring. However, newer easements often contain these provisions and provide endowments or other funding mechanisms to ensure long-term maintenance and monitoring. Sometimes the mitigation sites are transferred to or managed by local land agencies such as the Open Space Authority.

## The Nature Conservancy

Since its founding in 1958, The Nature Conservancy has developed in-depth, science-driven conservation plans for areas throughout the US and the world and has worked on more than 100 projects and preserves in California. Currently, The Nature Conservancy is working to preserve land in central California's Diablo Range between the Silicon and Central Valleys, including Mount Hamilton and its surrounding foothills. The Conservancy's Mount Hamilton Project seeks to protect the most ecologically critical 500,000 acres of this landscape by working with local cattle ranchers, public agencies, and other partners. The Mount Hamilton Project, launched in 1998 with the acquisition of the 32,800-acre Simon Newman Ranch in Stanislaus and Merced Counties, and the 28,100-acre Romero Ranch in Stanislaus and Santa Clara Counties, seeks to protect 250,000 acres of wilderness land through outright acquisitions and conservation easements (The Nature Conservancy 2006). In early 2008, this effort was bolstered by the establishment of a conservation easement on the 28,359-acre San Felipe Ranch. To date, The Nature Conservancy has permanently protected roughly 110,000 acres in the Mount Hamilton Range, approximately 51,350 acres of which are in the study area (**Table 2-2**).

The Nature Conservancy's strategy is to protect ecologically sensitive or unique sites and to connect the extensive public lands in the area—state, County and regional parks; university lands; and water district holdings—by securing the permanent protection of key private properties that surround and link them through conservation easement or purchase in fee title. The Nature Conservancy has been involved as a stakeholder in NCCP planning processes since the creation of the NCCP Act and has a long history of successful acquisition and stewardship efforts in NCCP reserve areas throughout the state.

Within the study area, The Nature Conservancy has acquired both permanent conservation easements and fee title to ranches east of U.S. 101. Land acquired in fee title has been transferred to land management agencies such as Henry W. Coe State Park, the CDFG, and the Open Space Authority (The Nature Conservancy 2006).

### 2.2.5 Protection and Resource Management Status of Open Space Lands

Public and private open space lands within the study area are subject to a variety of resource-management regimes. As a result, existing open space provides

different habitat quality for the covered species and natural communities. Because some of these existing open space lands may be relied upon to support the Reserve System, existing open space areas need to be distinguished by their values for the Plan conservation strategy. To do this, open space lands have been categorized as described below.

The value of protected open space areas for covered species and natural communities is greatest when land use protections are in place in perpetuity. The value of open space for the Plan is similarly improved when a natural resource management plan is in place and adequate funding exists to maintain or enhance populations or natural communities. Open space areas that do not have land use protections in perpetuity but do have ecological protection as their primary management goal may still support the Reserve System. However, unless permanent conservation easements are acquired for these areas, they will not be part of the Reserve System because of the risk of changes in land use or resource management emphasis.

The following classification of open space was developed to account for differences in land use protections and resource management emphasis and to assist in the development of the Plan conservation strategy.

## Open Space Classification

Protection and resource management status of open space lands has been evaluated and classified based on the level of land use protection and the general level of ecological management. Each open space unit within the study area was assigned one of four resource management types as shown in **Table 2-3**. The decision-making process used to assign open space lands to these types is shown in **Figure 2-4**.

Lands assigned to Type 1 and Type 2 open space categories have natural resource management and ecological protection as their primary purpose. Type 1 open space lands are protected from land use change by irrevocable means such as a conservation easement in perpetuity; or a local, state, or federal law. Local examples of Type 1 open space include lands owned by The Nature Conservancy, lands that are under a permanent conservation easement, and habitat or species mitigation lands subject to permanent easement. It is understood that the extent of ecological protection and management that actually occurs on these lands is subject to the availability of funding. The designation of Type 1 or Type 2 open space notes that the land use protections are in place on those lands, provided the funding becomes available.

If land use protections are not in perpetuity, but the purpose of land management is still ecological protection, then the land is assigned to Type 2 open space. If ecological protection is not the primary goal, but the land is managed as open space with some ecological value<sup>5</sup>, then it is assigned to Type 3 open space. If

<sup>5</sup> Allows multiple species to complete some portion of their life cycle (e.g., reproduction, growth, foraging) or provides critical refuge and movement opportunities (e.g., migration corridor).

the land is managed as open space, but offers little or no long-term or measurable ecological value, then it is assigned to Type 4 open space.

There are various types of open space in the unincorporated county in the study area including: 45,786 acres of Type 1 open space; 76,606 acres of Type 2; 37,065 acres of Type 3; and 4,109 acres of Type 4. Ninety one percent (91%) of all open space in the unincorporated county within the study area is owned by five entities: the California Department of Fish and Game owns 2%, the Open Space Authority owns 7%, The Nature Conservancy owns 23%, County Parks owns 24%, and State Parks owns 35%.

## 2.3 Covered Activities

This section describes the activities and projects within the permit area that will be covered by the final permits and for which the Plan will provide avoidance, minimization, and compensation (i.e., conservation) for impacts to covered species and natural communities. “Activities” are actions that occur repeatedly in one location or throughout the permit area. “Projects” are well-defined actions that occur once in a discrete location. Together, these activities and projects are the *covered activities* for which incidental take authorization from the Wildlife Agencies will be obtained. All activities described in Section 2.3 *Covered Activities* are covered activities that have been analyzed in Chapter 4 *Impact Assessment and Level of Take* unless specifically identified as not covered. Covered activities described in Sections 2.3.1 through 2.3.7 are covered activities that will be implemented by the Local Partners and private developers subject to the jurisdiction of the Local Partners. Covered activities described in Section 2.3.8 *Conservation Strategy Implementation* are associated with implementation of the Plan’s conservation strategy or recreation in the Reserve System and will be the responsibility of the Implementing Entity or, in the case of recreation, the owner of the land in the Reserve System (e.g., Implementing Entity, County Parks, Open Space Authority).

All parties seeking coverage for activities and projects under the Plan must obtain approval from the Permittee with jurisdiction over the activity or project or the location where the activity or project is proposed for implementation (city, County, or special district; see Chapter 6 *Conditions on Covered Activities and Application Process* for a description of the approval process).

All covered activities must incorporate the relevant conditions on covered activities described in Chapter 6 in order to avoid or minimize impacts to covered species and natural communities. Part of the approval process for parties seeking coverage under the Plan is demonstration that the conditions have been incorporated or will be incorporated properly into proposed projects. The descriptions of covered activities in this chapter have been written to be as consistent as possible with the conditions in Chapter 6. If any inconsistencies remain, the condition takes precedence over the description in this chapter. For complete details on the conditions on covered activities, see Chapter 6.

Projects and activities may only be covered if a Local Partner has control over design, avoidance and minimization, and mitigation associated with the project (as described in Chapter 5 *Conservation Strategy* and Chapter 6 *Conditions on Covered Activities and Application Process*). Local Partners may partner with other federal or state agencies, (e.g., the Corps or the California Department of Transportation) to develop the project, but the Local Partner must have control over the above described aspects of the project in order to ensure the terms of this Plan are implemented.

Development projects, or portion thereof, that are in the process of receiving local jurisdiction approvals at the time the Habitat Plan is adopted (i.e., “pipeline projects”) will not be subject to the Habitat Plan if all of the following apply:

1. it has received at least one of the following approved development entitlements with a specified expiration date (including allowed renewals/extensions) prior to Habitat Plan adoption: site and architectural permit/approval, planned development approval, conditional use approval, or a tentative map; and
2. it is issued a grading or building permit within 1 year of issuance of the Habitat Plan’s state and federal incidental take permits; and
3. the project review process identified no impacts to any of the Habitat Plan’s covered species.

This provision applies only to the portion of a project that is issued grading and/or building permit(s) within the 1-year period.

Activities or projects that do not fall clearly within the descriptions provided in this chapter will be evaluated on a case-by-case basis. If the Implementing Entity determines that a specific type of project or activity is not included within the descriptions in this chapter, then it will not receive coverage under this Plan. Any uncertainties regarding whether a type of project or activity can receive coverage under this Plan will be resolved by the Implementing Entity.

A described activity or project will be covered under the Plan if:

- the activity or project does not preclude achieving the biological goals and objectives of the Plan (see Chapter 5 *Conservation Strategy*) as determined by the Implementing Entity at the time the covered activity is proposed. For projects where there is some question whether or not the biological goals and objectives of the Plan may be precluded, the determination will be made by the Implementing Entity in coordination with the Wildlife Agencies;
- the activity or project is conducted by, or is subject to the jurisdiction of, one of the Permittees (see Chapter 8 *Plan Implementation* for a mechanism for a non-permittee to receive coverage under the Plan);
- the activity or project is a type of impact evaluated in Chapter 4 of the Plan; and

- adequate take coverage<sup>6</sup> under the permits remains available for other covered activities.

This definition includes projects that are currently anticipated and identified in this chapter, but that do not yet have fully developed project descriptions or plans. Provided that these projects meet the criteria above, they may be covered by this Plan. Project-specific identification as a covered activity, either in this chapter or through a future determination by the Implementing Entity, does not imply or grant entitlement for implementation. Project applicants are required to gain other project approvals from local jurisdictions and other regulatory agencies as necessary.

All covered activities described in this chapter apply to the two permits (CDFG and USFWS), with one exception. The use of pesticides, including herbicides and rodenticides, is not covered by the federal permit because USFWS has not authorized the EPA to certify their use.

## 2.3.1 Methods for Identifying Covered Activities

To begin the process of determining covered activities, the Permittees developed comprehensive lists of activities and projects under their direct control or jurisdiction that might have a need for take coverage. The following five criteria were used to screen the lists. Candidate activities and projects needed to meet all five criteria to be considered covered activities under the Plan.

1. **Location:** The project, activity, or government service will occur within the Plan permit area.
2. **Timing:** Construction of the project or implementation of activities is scheduled to begin after the Plan is approved and the project is completed within the term of the permit.
3. **Impact:** The project or activity has a reasonable potential or likelihood to take a covered species. Highly unlikely or speculative take will not meet this criterion.
4. **Definition:** The location, size, and other relevant aspects of the project or activity can be defined well enough such that direct and indirect impacts to covered species can be evaluated and conservation measures developed to mitigate those impacts.
5. **Practicability:** Inclusion of the project, activity, or government service as a covered activity will not result in undue delays or substantial additional cost to Plan development and permitting process relative to the benefit of including the project/activity in the permit. In other words, it will not be more cost effective to permit the project/activity separately. Examples of impractical covered activities are ones that, on their own, would add

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<sup>6</sup> Take coverage is defined in this Plan in terms of land cover type, modeled habitat (see **Tables 4-2 and 4-4**), and occurrences of covered plants (see **Table 4-6**) adversely affected as a result of covered activities.

additional covered species, generate substantial controversy, or significantly complicate the impact analysis.

## Covered Activity Categories

For the purposes of this Plan, covered activities fall into seven general categories.

- Urban Development.
- In-stream Capital Projects.
- In-stream Operations and Maintenance.
- Rural Capital Projects.
- Rural Operation and Maintenance.
- Rural Development.
- Conservation Strategy Implementation (activities within the lands managed, enhanced, restored, and monitored to conserve the natural resources targeted by this Plan).

Covered activities are identified below for each of these seven categories. The activities described are those activities for which incidental take authorization will be requested by the Permittees.

The activities identified below broadly define all of the different types of activities covered by this Plan. In some cases, specific projects are identified as examples to illustrate the general category. However, if a given project meets the guidelines for covered activities as described in the first part of this section, then that project is a covered activity.

It is expected that the Permittees will develop additional activities and projects over the course of the permit term of this Plan. To the extent that these additional activities and projects are generally and qualitatively described below, meet the criteria in Section 2.3 *Covered Activities* above, are not expressly limited by this chapter, and are adequately evaluated in Chapter 4 of this Plan, these future activities and projects will also be covered by this Plan.

Descriptions of covered activities in this chapter are mostly qualitative. Additional quantitative assumptions of covered activity footprints and frequency of occurrence are described in the impact analysis methodology in Chapter 4.

### 2.3.2 Urban Development

This category includes projects and activities that occur inside the planning limits of urban growth (see **Figure 2-2**) but outside of in-stream areas (streams and adjacent riparian vegetation) and excluding those areas identified in Section 2.2.3 *Planning Limits of Urban Growth* as these will be developed consistent with

rural development land use patterns. In-stream covered activities are discussed in Sections 2.3.3 *In-Stream Capital Projects* and 2.3.4 *In-Stream Operations and Maintenance*. This category is intended to be as inclusive as possible to accommodate urban growth and all ground-disturbing activities within designated urban areas. It includes the construction and maintenance of typical urban facilities, public and private, consistent with local general plans and local, state, and federal laws. This category of covered activities includes, but is not limited to, the construction, maintenance, and use of the following urban facilities.

- Residential, commercial, industrial, and other types of urban development within the cities of Gilroy, Morgan Hill, and San José planning limits of urban growth in areas designated for urban or rural development, including areas that are currently in the unincorporated County (i.e., in “pockets” of unincorporated land inside the cities’ planning limits of urban growth).
- Residential, commercial, industrial, and other types of urban development within the San José–designated North Coyote Campus Industrial Area in areas with land use designated for urban development, rural development, and agricultural development as identified in **Figure 2-2**.
- Transportation facilities including sidewalks, bike paths, paved and unpaved roads, bridges, culverts, and transit facilities.
- Public service and cultural facilities including new fire stations, police stations, community policing centers, communications facilities, public administration centers, convention centers, theatres, museums, community centers, community gardens, and concession buildings.
- Recreational facilities such as neighborhood parks, dog parks, soccer fields, golf courses, indoor and outdoor sports centers, racetracks, campgrounds, and trails, and associated infrastructure including roads, bridges, parking areas, and restrooms.
- Public and private utilities including electric transmission and distribution lines, telecommunications lines, and gas pipelines. Solar energy projects are covered by the Plan as long as their impacts to covered species and natural communities are consistent with the evaluation of effects in Chapter 4.
- City water delivery and storage facilities including water treatment plants, water supply pipelines, percolation ponds, and pump stations (SCVWD is the water wholesaler in the county and serves local water suppliers).
- Stormwater management facilities such as storm sewer systems, nonpoint source reduction, outfalls, and drainage improvements.
- Waste-management facilities including sewage-treatment plants, sanitary sewer systems and rehabilitation, water recycling, recycling centers, transfer stations.
- Funeral/interment services including mortuaries, crematorium, columbaria, mausoleums, and similar services when in conjunction with cemeteries.
- Vegetation management including fuel reduction (including hand and mechanized removal and controlled burns), tree removal and pruning,



grazing activities, exotic vegetation control/removal, hazardous tree work, weed abatement, algae control in ponds.

- Hazardous material remediation for, and restoration related to, abandoned dumps (e.g., Singleton Landfill).

The Cities of San José, Gilroy, and Morgan Hill have developed several planning documents that outline strategies and projects consistent with current general plans. Examples of current plans that apply to planning in urban areas within the study area include the following.

- City of San José Greenprint (City of San José 2000).
- City of San José Alum Rock Park Riparian Management Plan (Biotic Resources Group 2001).
- City of San José Sanitary Sewer Master Plan (City of San José 2004).
- City of San José Storm Sewer System Capital Program (City of San José 2006b).
- City of San José Sanitary Sewer System Capital Program (City of San José 2006c).
- City of San José and City of Santa Clara Draft San Jose/Santa Clara Water Pollution Control Plant Master Plan (City of San José and City of Santa Clara 2011)<sup>7</sup>.
- City of Morgan Hill Redevelopment Agency Implementation Plan (City of Morgan Hill 2004).
- City of Morgan Hill Downtown Specific Plan (City of Morgan Hill 2009).
- City of Morgan Hill Parks, Facilities & Recreation Programming Master Plan (City of Morgan Hill 2001c).
- City of Morgan Hill Bikeways Master Plan Update (City of Morgan Hill 2008).
- City of Morgan Hill Trails and Natural Resources Study (City of Morgan Hill 2007).
- City of Morgan Hill Capital Improvement Program (City of Morgan Hill 2002a).
- City of Morgan Hill Sewer System Master Plan (City of Morgan Hill 2002b).
- City of Morgan Hill Storm Drainage System Master Plan (City of Morgan Hill 2002c).
- City of Morgan Hill Water Master Plan (City of Morgan Hill 2002d).
- City of Morgan Hill Environmental Programs (City of Morgan Hill 2007).
- City of Gilroy Bicycle Master Plan (City of Gilroy 2002c).

<sup>7</sup> Only those portions of the San José/Santa Clara Water Pollution Control Plant Master Plan area that are inside the study area (which does not include the extended study area for burrowing owl conservation) may be covered by the Habitat Plan.

- City of Gilroy Parks and Recreation Systems Master Plan (City of Gilroy 2002d).
- City of Gilroy Sanitary Sewer Master Plan (City of Gilroy 2004a).
- City of Gilroy Storm Drain Master Plan (City of Gilroy 2004b).
- City of Gilroy Traffic Master Plan (City of Gilroy 2004c).
- City of Gilroy Water Master Plan (City of Gilroy 2004d).
- City of Gilroy Glen-Loma Specific Plan (City of Gilroy 2005a).
- City of Gilroy Trails Master Plan (City of Gilroy 2005c).
- City of Gilroy Wastewater Treatment Plant Master Plan (City of Gilroy 2006b).
- South County Recycled Water Master Plan (Santa Clara Valley Water District and South County Regional Wastewater Authority 2004).

Additional plans will be developed over the course of the permit term of this Habitat Plan. Activities proposed in these future plans that are consistent with the criteria in Section 2.3 *Covered Activities* and that have been adequately addressed in the impacts analysis contained in Chapter 4 and the conservation strategy described in Chapter 5 will also be covered by this Plan.

## Private Development Subject to the Plan

Private development activities that require ground disturbance are subject to the Habitat Plan if the activity meets the following criteria.

1. The activity is subject to either ministerial or discretionary approval by the County or one of the cities;
2. The activity is described in Section 2.3.2 *Urban Development* or in Section 2.3.7 *Rural Development*; and
3. In **Figure 2-5**<sup>8</sup>, the activity is located in an area identified as “Private Development is Covered,” OR

The activity is equal to or greater than 2 acres AND the project is located in an area identified as “Rural Development Equal to or Greater than 2 Acres is

<sup>8</sup> **Figure 2-5** *Private Development Areas Subject to the Plan* was developed to distinguish areas where, with respect to future rural development, there is higher biodiversity and a greater chance for “take” of covered species versus areas where habitat values are lower and the potential for “take” is relatively low. Information sources used in defining these areas included USFWS critical habitat; areas mapped by the Plan (**Figure 3-10**) as serpentine, wetland, stream, riparian, or pond land cover types; conservation analysis zones with a “high” conservation effort designation (**Figure 5-7**); and mapped occurrences of covered wildlife species. In areas where this information indicated a higher potential for presence of covered species, rural development projects are subject to the Habitat Plan. In areas where the information indicates a low probability that covered species are present, rural development projects are not subject to the Habitat Plan. **Figure 2-5** will be updated throughout the permit term to reflect new information collected during Plan implementation.

Covered,” or “Urban Development Equal to or Greater than 2 Acres is Covered” OR

The activity is located in an area identified as “Rural Development is not Covered” but, based on land cover verification of the parcel (inside the Urban Service Area) or development area (for rural development projects; see Section 6.8 *Habitat Plan Application Package*), the project is found to impact serpentine, wetland<sup>9</sup>, stream, riparian, or pond land cover types; or the project is located in occupied or occupied nesting habitat for western burrowing owl (see **Figure 5-11** and **Appendix D Species Accounts**).

In addition, private development additions of less than 5,000 square feet of new impervious surface to existing developed sites, regardless of parcel size, are not subject to the Plan.

Projects that are not subject to the Habitat Plan because they do not meet these criteria are *not exempt from compliance with the ESA or CESA*. If a project has the potential to take a federally or state listed species, the applicant must contact USFWS and/or CDFG to determine whether a take authorization should be obtained. Project applicants may request to “opt in” to the Habitat Plan and receive take coverage by complying with all of the conditions and application processes described in this Plan (see Chapter 6). Opt in coverage is not guaranteed and will be authorized by the local jurisdiction in consultation with the Implementing Entity.

This coverage determination process only applies to private urban and rural development that requires a permit from a city or the County. It does not apply to activities initiated by the Local Partners or Participating Special Entities (see Section 8.4 *Participating Special Entities* for more information).

### 2.3.3 In-Stream Capital Projects

The term *in-stream* is defined for the purposes of this Plan as the stream bed and bank, and the surrounding adjacent riparian corridor. This category addresses public infrastructure projects that occur within streams. Activities within streams are those activities or projects that occur in or immediately adjacent to creeks and that may result in impacts to a creek or canal. This category includes activities in the stream channel, along the stream bank, and adjacent lands at top-of-bank within the riparian corridor. These covered activities occur in both urban and rural areas. Known locations of in-stream capital projects are shown in **Figure 2-6**. The operation and maintenance of these projects, as well as existing facilities, are described in Section 2.3.4 *In-Stream Operations and Maintenance*.

In-stream capital projects and activities that are covered under this Plan include the following activities.

<sup>9</sup> If during the environmental review process it is shown that a project has adverse indirect impacts to a wetland’s function (change in hydrological functions, etc.), the project will be subject to the Plan.

- Activities described above under Section 2.3.2 *Urban Development* that overlap with streams. Activities include transportation, water supply, wastewater management, and stormwater management.
- Construction or reconstruction of flood protection projects and maintenance of associated access roads (see discussion in following section).
- Reconstruction of levees.
- Three Creeks Habitat Conservation Plan geomorphic rehabilitation and gravel program.
- Reconstruction, realignment, and decommissioning of SCVWD canals.
- Dam-related capital projects.
- In-channel groundwater recharge facilities.
- Bridge construction, replacement, and major repair including vehicular, train, and pedestrian bridges (see discussion in following section below).
- Bridge construction in County parks including vehicular bridges, multi-use bridges, footbridges, puncheons, and rock bridges (i.e., rocks placed across a small stream along a single-track trail).
- Culvert installation and maintenance.
- Creekside trail projects and associated bridges (trails are discussed in more detail in Section 2.3.5 *Rural Capital Projects*).
- Implementation of SCVWD's Dam Instrumentation Project. Activities include a field geotechnical exploratory drilling program and providing a corresponding Automated Data Acquisition System for the eight SCVWD dams within the study area (see discussion below).
- Fish passage barrier removals.

Capital projects that are covered under this Plan are discussed in more detail in the following sections.

## Flood Protection Projects

SCVWD maintains a rolling 5-year Capital Improvement Program that determines which projects are developed over time. SCVWD has several capital projects planned to address flood protection. These projects have been identified through various programs that provide different funding mechanisms and guiding principles of how projects will be planned and designed. Two such programs are the Clean, Safe Creeks and Natural Flood Protection Plan and the Coyote Watershed Stream Stewardship Plan. Each plan is briefly described below. Flood protection projects identified in these plans are described at the end of this section.

The Clean, Safe Creeks and Natural Flood Protection Plan is a single, countywide special tax-funded 15-year plan, part of the SCVWD flood

protection and stream stewardship program. Performing public oversight for this program is an independent monitoring committee, which annually reviews the implementation of the Program. As part of the Clean, Safe Creeks and Natural Flood Protection Program, SCVWD is directed to protect public health and safety and enhance the quality of life within Santa Clara County. Initiated in 2000, it identifies four outcomes: provide flood protection, protect water quality, enhance and restore in-stream and riparian ecosystems, and provide recreational access. The first outcome, flood protection, includes the flood control capital control projects. During project planning, flood protection projects are prioritized by flooding history, damage estimates, and economic impacts. Project design protects against a 1% flood while improving water quality, restoring natural habitat, and providing recreational and operations and maintenance access (Santa Clara Valley Water District 2000). Of the covered flood protection capital projects described below, improvements to Berryessa Creek, Coyote Creek, and Upper Penitencia Creek are partially funded by the Clean, Safe Creeks and Natural Flood Protection Plan.

The Coyote Watershed Stream Stewardship Plan addresses flooding and environmental issues through an integrated approach to watershed management. SCVWD developed the Coyote Watershed Stream Stewardship Plan to provide a strategic approach for implementing the Ends Policy using a watershed management approach to provide stream stewardship within the Coyote watershed. The Ends Policy, in part, envisions a watershed in which (1) there is a healthy and safe environment for residents and visitors, and (2) there is an enhanced quality of life in Santa Clara County (Santa Clara Valley Water District 2002). This plan documents long-range projections of several agencies, incorporates information from ongoing SCVWD projects, and defines future projects and strategies to achieve SCVWD's Ends Policy in the watershed. Projects implemented under this plan include, but are not limited to, flood control projects, new trails, acquisition of open space, and stormwater detention and infiltration (Santa Clara Valley Water District 2002). Examples of projects partially funded through the Coyote Watershed Stream Stewardship Plan include the Berryessa Creek Project and the Lower Silver Creek between Interstate 680 (I-680) and Lake Cunningham. In designing projects through both programs, SCVWD uses methods that balance flood protection with protection of streams and natural resources. Examples of these methods include expanding the in-channel flood plain in areas where the existing channel is highly constrained, and installing bypass channels to reduce the quantity of water flowing through natural streams during high flows, thus reducing flooding and scouring potential. These flood-protection technologies help keep streams as natural as possible.

## **Flood Protection Project Design Elements**

Flood protection capital improvement projects incorporate design elements that provide onsite impact avoidance, minimization, and mitigation for both in-stream and riparian habitat. Enhancement and creation of riparian habitat is coupled with removal of invasive species and planting of native species. In-stream design elements include fish passage improvement through the removal of fish barriers, placement of fish ladders, and other in-stream habitat enhancements. Finally,

design elements protect in-stream water quality by reducing erosion, sedimentation, and turbidity, as well as removing unauthorized storm drain outfalls (Santa Clara Valley Water District 2000).

Flood control design components that may be utilized include those listed below.

- Regrading of bank slopes.
- Realignment of the historic full channel or active low-flow channel.
- Installation of hardscape, including at stream crossings (concrete or riprap).
- Installation of grade control features (e.g., check dams, vortex weirs, cross vanes, drop structures, step pools, and rock riffles) to control erosive velocities.
- Temporary stream diversion during construction.
- Planting<sup>10</sup>.
- Channel widening.
- Levee reconstruction activities including installation or improvement of floodwalls and/or levees. Flood protection levee work may result in a raised or expanded levee. (Reconstruction activities are further described in the following section *Levee Reconstruction*.)
- Permanent bypass or diversion channel construction.
- Acquisition of right-of-way and maintenance road construction.
- Installation of culverts or outfall structures, including inlet and outlet structures for detention basins.
- Off-channel detention basins.

Planning and design of flood protection projects requires several years to decades to complete. Construction may take weeks or years to complete, depending on whether the project is phased over time and the nature of the project in a given reach. The process is often complicated when multiple agencies are participating in the project. As such, it is difficult to identify a timeline within which these projects may be implemented. SCVWD will apply all conditions as described in Chapter 6 when implementing flood protection projects, including review and approval by the Wildlife Agencies as described in Section 8.7.3 *Wildlife Agency Responsibilities*.

Those projects for which project descriptions are currently available are described below. For those projects for which no project description has been developed, a brief description of project location is provided. These projects will contain the same types of design elements as those for which a project description has been developed because of SCVWD's commitment to flood protection and stream stewardship as described above. **Tables 4-5a and 4-5b**

<sup>10</sup> All planting will be implemented to allow proper flood conveyance and will consist of hydroseeding on all earthen surfaces above the channel bed and tree planting at the top of bank, with a few additional trees planted on bank slopes and at toe-of-slope.

describe key assumptions used to estimate impacts associated with these projects that could not be fully described during Plan development.

Coverage for SCVWD flood protection projects is limited to 64 miles of total project length with a maximum of 3.1 miles of permanent stream impacts.

## Coyote Watershed

**Berryessa Creek—I-680 to Old Piedmont Road.** Berryessa Creek is a tributary of Coyote Creek located in San José. The project extends approximately 2 miles between I-680 and just upstream of Old Piedmont Road. Currently the creek has sections that are natural, a section that is a trapezoidal concrete channel, and a concrete lined in-stream sediment basin. Specific design details for this project area have not been developed at this time; however, they will be consistent with the design elements described above.

**Coyote Creek—U.S. 101/I-85 to Metcalf Road.** Coyote Creek is an urban stream within San José. This reach is 5.6 miles and is bordered by the Coyote Creek Park. Between I-85/U.S. 101 interchange and Metcalf Road, the reach is modified to form the Parkway Lakes. The project extends from the I-85/U.S. 101 to Metcalf Road. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Coyote Creek—I-280 to U.S. 101.** Coyote Creek is an urban stream within San José. This reach is 6.7 miles and is bordered by the Coyote Creek Park. The project extends from I-280 to U.S. 101. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Fisher Creek—Bailey Avenue to Hale Avenue.** Fisher Creek is a tributary of Coyote Creek. The reach is 5.4 miles and flows from Morgan Hill through unincorporated San José and into Coyote Creek at its intersection with Monterey Highway in San José. The project extends from Bailey Avenue in unincorporated San José to Hale Avenue in Morgan Hill. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above. It is possible that the City of San José will be the lead on this project instead of SCVWD.

**Mid-Coyote Creek—Montague Expressway to I-280.** The project extends approximately 6.1 miles between Montague expressway and I-280, all in the City of San José. Still in the planning phases, the project is expected to include channel capacity improvements such as levee construction, channel excavation, bridge replacement, property acquisition and structural removal. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Quimby Creek—Thompson Creek to Headwaters.** Quimby Creek is a tributary of Thompson Creek. Within San José it is highly channelized. The

project extends 1.2 miles from Thompson Creek to its headwaters. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Sierra Creek—Berryessa Creek to Headwaters.** Sierra Creek is a tributary of Berryessa Creek in San José. Within the urban limits it is highly channelized, composed of a concrete trapezoidal channel. The project extends 2.4 miles from the stream's headwaters to Berryessa Creek. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**South Babb Creek—Lower Silver Creek to Headwaters.** South Babb Creek is a tributary of Lower Silver Creek extending from unincorporated San José into San José. It is currently a culvert/trapezoidal concrete channel. Specific design elements for this 0.9 mile project have not been developed at this time; however, they will be consistent with the design elements described above.

**Upper Penitencia Creek—Coyote Creek to Dorel Drive.** This project occurs along approximately 4.2 miles of Upper Penitencia Creek, from the confluence with Coyote Creek to Dorel Drive. Project goals include the following.

- Provide one-percent flood protection to more than 5,000 homes, businesses and public buildings;
- Improve stream habitat values and fisheries potential;
- Reduce sedimentation and maintenance requirements;
- Identify opportunities to integrate recreation improvements consistent with the Master Plan of the City of San José and Santa Clara County Parks;
- Obtain a Letter of Map Revision from the Federal Emergency Management Agency (FEMA); and
- Incorporate SCVWD's Clean, Safe Creeks and Natural Flood Protection Program objectives.

Design elements include a concrete culvert, percolation pond, realignment of the creek at I-680, levees and floodwalls, modified floodplains, and residential home floodproofing.

**Upper Silver Creek—U.S. 101 to Coyote Creek.** Upper Silver Creek is a tributary of Coyote Creek within San José. They converge just south of Coyote Creek's intersection with Capitol Expressway and northwest of U.S. 101. The channel is composed of earthen levees and excavated earth. The project extends 0.7 mile from U.S. 101 to Coyote Creek. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Upper Silver Creek—U.S. 101 to Silver Creek Road.** Upper Silver Creek is a tributary of Coyote Creek within San José. They converge just south of Coyote Creek's intersection with Capitol Expressway and northwest of U.S. 101. The channel is composed of earthen levees and excavated earth. The 1.2 mile project



extends from U.S. 101 to Silver Creek Road. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

## Guadalupe Watershed

**Alamitos Creek—Guadalupe River to Almaden Dam.** The project extends 7.4 miles from Almaden Dam to the Guadalupe River. Specific flood protection design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above. In addition, design elements will also include fish barrier modifications both at the gabion structure upstream of Mazzone Drive and at the creek's confluence with the Guadalupe River.

**Arroyo Calero—Alamitos Creek to Calero Dam.** Arroyo Calero runs from Calero Reservoir to Alamitos Creek through unincorporated County into San José. The project extends the entire 4 mile extent of the arroyo. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Canoas Creek—Guadalupe River to Cotle Road.** The project extends 7.4 miles from Canoas Creek's confluence with the Guadalupe River to Cotle Road. Design elements include the construction of 3.5-foot-high floodwalls along Canoas Creek from Almaden Expressway to the end of Nightingale Drive (Santa Clara Valley Water District 1999).

**Los Gatos Creek—Kirk Dam to Lark Avenue.** Los Gatos Creek is a tributary of the Guadalupe River. The project extends 0.7 mile from Kirk Dam to Lark Avenue within the cities of Los Gatos and Campbell, within a right-of-way owned by SCVWD. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Randol Creek—Alamitos Creek to Bret Harte Drive.** Randol Creek is a highly channelized tributary of Alamitos Creek in San José. It is primarily a trapezoidal earthen channel with periodic concrete structures for flood control purposes. The project extends approximately 0.5 mile from Bret Harte Drive to Alamitos Creek. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Ross Creek—Guadalupe River to Kirk Avenue.** Ross Creek is a highly channelized tributary of the Guadalupe River. It is primarily a trapezoidal earthen channel with periodic and various hard structures for flood and bank protection purposes. The approximately 1.6-mile project reach extends from Guadalupe River to Kirk Avenue in San José. Currently, Ross Creek is primarily a trapezoidal earthen channel. Design elements include widening the channel bottom to 30 feet with 1:1 side slopes and lining both banks with articulated concrete mat. An 18-foot maintenance road will be established on the south top

of bank and depressed 3 feet below grade for security of adjacent properties. If necessary, the existing streamflow gauge station will be replaced in coordination with technical support staff. In addition, a second 20- by 10-foot RCB culvert will be added on the north side of the existing culvert under Almaden Expressway. A concrete apron will be constructed at the outlet of the culvert. The existing sewer line in Almaden Expressway will be relocated in coordination with the City. Similarly, at Jarvis Avenue, a second 13- by 9.5-foot box culvert will be constructed. Design elements will also include fish passage modifications (Santa Clara Valley Water District 1999). Where applicable, revegetation and other riparian habitat enhancements will be included.

## Uvas Watershed

**Gavilan Creek—Uvas Creek to Headwaters.** Gavilan Creek varies from a trapezoidal earthen channel to a clay-lined channel and contains a variety of flow control structures including culverts, energy dissipaters, drop structures, pipelines, and sacked concrete riprap lining. The 3.1-mile project runs from Uvas Creek to the headwaters Gavilan Creek. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Uvas-Carnadero Creek—Pajaro River to Watsonville Road.** Uvas-Carnadero Creek, in the vicinity of Gilroy, is the major river in the Uvas watershed. The project will extend 13.8 miles from the Pajaro River to Watsonville Road as the upper boundary. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above. Design elements will also include fish passage and habitat modifications.

## Llagas Watershed

**East Little Llagas Creek—U.S. 101 to Headwaters.** East Little Llagas Creek is in the vicinity of Gilroy. The project will be conducted in a rural setting and extends 0.8 mile from U.S. 101 to the creek's headwaters. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Jones Creek—Llagas Creek to Alamias Creek.** Jones Creek is in the vicinity of Gilroy. The project will be conducted in a rural setting and extends 2.4 miles from Llagas Creek to Alamias Creek. Specific design elements for this project have not been developed at this time; however, they will be consistent with the design elements described above.

**Lions Creek—Sta 102+00 to Headwaters.** Lions Creek is in the vicinity of Gilroy. The 1.1-mile project will be conducted in a rural setting and extends from U.S. Geological Survey (USGS) gauge station 102+00 to the headwaters of Lions Creek. Specific design elements for this project have not been developed

at this time; however, they will be consistent with the design elements described above.

**West Little Llagas Creek—Wright Avenue to Llagas Road.** The project extends 0.6 mile from Wright Avenue to Llagas Road and includes two reaches: 7 and 8a. Reach 7 is further subdivided into Reach 7a and 7b, as different design elements will be applied to each subsection. Design elements for Reach 7 are uncertain. In the Llagas Creek EIR (U.S. Department of Agriculture 1982), design elements for Reach 7a (1.6 miles) include 1 mile of excavated trapezoidal/earthen channel with depressed maintenance roads and a rock-lined pilot channel, as well as installation of a grade stabilization structure. Design elements for Reach 7b (0.9 mile) include earthen channel excavation with a depressed maintenance road and a pilot channel. Design elements for reach 8a (1.0 mile) include installation of a rectangular concrete channel. In the more recent Llagas Status Report (Santa Clara Valley Water District 2007c), design elements for Reach 7 are not subdivided and are described as construction of an earthen channel diversion and an earthen channel.

## Levee Reconstruction

SCVWD owns or maintains approximately 91 miles of levees or similar flood reduction facilities. Approximately 23 miles of these levees are within the study area. Sections of these levees are currently under the jurisdiction of the Corps, but jurisdiction is not constant and may change over the course of the permit term (e.g., a section of levee currently under Corps jurisdiction may not be under Corps jurisdiction in 20 years). Reconstruction of 10 miles of the approximately 23 miles of levees are covered by this Plan (see Section 2.4 *Projects and Activities not Covered by this Plan* for information on levee reconstruction projects that are led by the Corps). The 10 miles of levee reconstruction assumed for this Plan is additive to levee improvements conducted as part of a flood protection project. As described in Chapter 8, the Wildlife Agencies will have design review and approval authority over flood protection projects and levee reconstruction projects that are covered by the Habitat Plan.

The Corps has revised its inspection standards and compliance (enforcement) requirements for levee systems under their jurisdiction which are maintained by local agencies. Levee maintenance activities, including vegetation removal and burrow and rodent control on all levees, are permitted under SCVWD's Stream Maintenance Program and are not covered by this Plan. When structural improvements to the levees are required, either for increased flood protection or major failures in structural integrity, the Plan would provide take authorization for this levee reconstruction activity so long as they are part of another covered project such as a flood protection project or described below in this section.

Levee reconstruction activities are those that improve the existing facility through structural changes such as expanding the footprint, increasing the height of the levee, or adding new material to support the levee. Reconstructed levees will generally be constructed with in-kind materials and within the footprint of existing levees. Some changes to levee design and material may be required

based on safety and design requirements. This may include adding new hardscape to the channel banks.

Levee reconstruction areas will be outside mitigation sites associated with this Plan or past projects. No reconstruction or associated clearing of riparian vegetation that provides baseline shaded riverine aquatic cover will be conducted as part of this covered activity. Furthermore, SCVWD is only seeking coverage for reconstruction of 10 of the 23 miles of SCVWD levees in the study area. The levees, or portions thereof, identified below may be reconstructed under this Plan if the Plan requirements for avoidance described in this paragraph and in Chapter 6 are met. Levee reconstruction projects are covered by this Plan only if they are specifically named below or are part of another covered project such as a flood protection project. Although there are a total of 25.1 miles of levees referenced below, this Plan only covers impacts associated with 10 miles of levee reconstruction. See **Table 4-5a** for a description of assumptions made for this covered activity.

## Coyote Watershed

**Berryessa Creek.** Berryessa Creek is an urban creek in the Coyote watershed. It is connected to the Lower Penitencia Creek by an engineered canal. Levee reconstruction will occur between the boundary of the City of San José and Piedmont Road (approximately 0.4 miles).

**Coyote Creek.** Coyote Creek is the main stem of the Coyote watershed. In San José, it is primarily maintained with riparian vegetation on both sides. This vegetation extends into a chain of riverside parks along its upper extent. Levee reconstruction will occur on both sides of the creek in three different locations between the confluence with Upper Penitencia Creek and the northern edge of the permit area, north of (downstream) SR 237 (approximately 1 mile).

**Thompson Creek.** Thompson Creek is an urban stream in the Coyote watershed. It flows through San José constrained by both a natural and modified floodplain. For much of its extent, riparian vegetation lines the banks. Levee reconstruction will occur on both sides of the creek between Aborn Road and Quimby Road (approximately 0.5 mile).

**Upper Penitencia Creek.** Upper Penitencia Creek is in the Coyote watershed. Levee reconstruction will occur to the west of I-680 between Berryessa Road and Mayberry Road (approximately 1.1 mile).

## Guadalupe Watershed

**Alamitos Creek.** Alamitos Creek is a large tributary of the Guadalupe River in the Guadalupe watershed. Riparian vegetation is maintained on both sides as it flows through San José. Levee reconstruction will occur at three separate locations. Levees will be reconstructed along 3.6 miles of Alamitos Creek

upstream of its confluence with Guadalupe Creek (also where Guadalupe River begins).

**Canoas Creek.** Canoas Creek is a tributary of the Guadalupe River in the Guadalupe watershed. Levee reconstruction will occur immediately upstream of its confluence with Guadalupe River (approximately 0.5 miles).

**Guadalupe Creek.** Guadalupe Creek is a tributary of Guadalupe River in the Guadalupe Watershed. Levee reconstruction will occur between where the creek approaches Coleman Road and just downstream of the confluence with Alamitos Creek (i.e., in the initial upstream reaches of Guadalupe River). Total length of levee reconstruction is approximately 1.5 miles.

**Guadalupe River.** Guadalupe River is the major river of the Guadalupe watershed. It is primarily maintained with riparian vegetation on both sides. Levee reconstruction will occur in several locations along Guadalupe River. From the upstream end, the first reconstruction section starts just north and ends just south of where the creek crosses the SR 85. Downstream, a short reach of levee is located just upstream of the confluence of Guadalupe River and Los Gatos Creek, between the I-280 and West Humboldt Street. Finally, levee reconstruction will occur between U.S. 101 and I-880. Total length of levee reconstruction is approximately 2.9 miles.

**Los Gatos Creek.** Los Gatos Creek is a large tributary of the Guadalupe River in the Guadalupe Watershed. It flows through Campbell, Los Gatos and Monte Sereno. Levees are located in three separate locations downstream of Vasona Reservoir and upstream of the San José city limits. Total length of levees is approximately 1.8 miles.

**Randol Creek.** Randol Creek is a highly channelized tributary of Alamitos Creek in San José. It is primarily a trapezoidal earthen channel with periodic concrete structures for flood control purposes. Levee reconstruction will occur on the east side between Camden Avenue and Bret Harte Drive (approximately 0.5 mile).

## Uvas Watershed

**Uvas Creek.** Uvas Creek is the main stem of the Uvas watershed. Levee reconstruction will occur only on the north side of the creek between U.S. 101 and Santa Teresa Boulevard (approximately 2.2 miles) in Gilroy and unincorporated Santa Clara County near Gilroy.

## Llagas Watershed

**Jones Creek.** Jones Creek is a small earthen tributary of Alamais Creek (a tributary to Llagas Creek) in the Llagas watershed. It flows through the agricultural landscape of unincorporated Santa Clara County, east of Gilroy and

west of SR 152. Levee reconstruction will occur on its west side between its confluence with Alamaia Creek between Leavesley Road and Dunlap Road (approximately 0.6 mile).

**Llagas Creek.** Llagas Creek is the main stem river in the Llagas watershed. It is primarily an earthen channel and passes through both unincorporated Santa Clara County and the city of Gilroy. Levee reconstruction will occur on the west side of Llagas Creek from the confluence with the West Branch Llagas Creek north to Gilman Road (approximately 0.8 mile) in agricultural areas.

Levee reconstruction is also planned for lower Llagas Creek between Southside Drive and the creek's confluence with the Pajaro River. Levee reconstruction will occur on both sides of the creek (approximately 2.4 miles).

**Levees near Llagas Creek.** A network of irrigation channels divert water from Llagas Creek in the Llagas watershed. Levee reconstruction will occur on one side between the Pacheco Pass Highway and Bloomfield Avenue (approximately 5.9 miles). These levees do not border Llagas Creek.

**Lions Creek.** Lions Creek is located partially within the planning limit of urban growth of Gilroy. The proposed levee reconstruction would occur just upstream of the confluence with West Branch Llagas Creek (approximately 0.5 miles).

**West Branch Llagas Creek.** West Branch Llagas Creek is a highly channelized tributary of the Llagas Creek flowing through the city of Gilroy. Levee reconstruction will occur on both sides of the creek between its confluence with the main Llagas branch and U.S. 101, predominantly in agricultural areas (approximately 1.1 miles).

## Canal Reconstruction, Realignment, and Decommissioning

SCVWD anticipates needing to fully reconstruct, realign, or decommission its water conveyance canals over the course of the permit term. These canals, their associated diversions, and release points include the following.

- Almaden-Calero Canal
- Coyote Canal Extension
- Cochrane Channel
- Coyote-Alamitos Canal
- Vasona Canal
- Madrone Channel

Coyote Canal may be extended to Metcalf Road by reconstruction in place, or by replacement with a pipeline in the existing alignment or within the alignment of existing multi-use trails in this reach of Coyote Creek. Subsequent phase

activities may include a pipeline to Ford Road Ponds from the Coyote Steel Dam and the Coyote Canal Extension.

Other canals will be reconstructed or replaced with pipelines in the existing footprint of current canals. Canals will be reconstructed of in-kind materials to the extent possible. Depending on the history of erosion in a canal, certain reaches may be reconstructed using gunite or other types of concrete. Most straight reaches without a history of erosion will be of compacted earth. Reconstruction of canals is assumed to result in complete loss of existing, non-developed, land cover types.

SCVWD anticipates possibly decommissioning one or more of its canals. This would be conducted only as needed and when there is a desire to use the canal site for another purpose or to use for restoration credits. Each decommission would be unique, but in general would entail removal of unnecessary concrete and other materials from the site. It is likely that decommissioning would restore canals to an enhanced state for natural resource management purposes; credits for such enhancement are not assumed in the impact analysis in Chapter 4.

## Three Creeks HCP In-Stream Capital Projects

Capital projects associated with the proposed Three Creeks HCP are the seismic safety retrofit of five SCVWD dams in the permit area (Almaden, Anderson, Calero, Guadalupe, and Vasona dams) and the proposed conservation measures in the Three Creeks HCP Conservation Program. Seismic safety retrofit activities are described in the following section *Dam Seismic Safety Retrofit*. The Three Creeks HCP Conservation Program is described in the following section.

## Three Creeks HCP Conservation Program

The proposed Three Creeks HCP includes activities to enhance stream conditions for steelhead, while maintaining use of these watersheds to meet the water supply needs of northern Santa Clara County. The proposed Three Creeks HCP Conservation Program will provide a comprehensive program to address the impacts of SCVWD's operation and maintenance of eight reservoirs (six of which are in the permit area), multiple diversions dams and drop structures and associated facilities (i.e., appurtenances) such as fish ladders, fish screens, and on-channel ponds; an extensive system of off-channel recharge ponds, and facilities that provide for water to be released to various channels. Although fish are not covered by this Plan, covered species such as the California red-legged frog, foothill yellow-legged frog, and California tiger salamander may be affected by implementation of the Three Creeks Conservation Program.

The Three Creeks Conservation Program is still under development by SCVWD; thus, while this Plan provides coverage for covered species that are affected by the activities described below, the discussion of these activities are at a programmatic level. Once the Three Creek HCP Conservation Program has been

adopted the range of activities and impacts will be better understood. Therefore, for specific project impacts that cannot be evaluated, coverage under this Plan would be conditioned upon additional review and approval by the Wildlife Agencies (see Section 8.7.3). The covered activities are described to encompass as much of the activities in the Three Creeks HCP Conservation Program as is currently expected to occur.

The proposed Three Creek HCP Conservation Program includes seven components that will receive take coverage under this Plan.

- Geomorphic Rehabilitation
- Alamitos Creek/Almaden Reservoir Fish Passage
- Gravel Enhancement
- Reservoir and Recharge Re-Operation
- Upper Penitencia Creek Management Program
- Supplemental Flow Program
- Monitoring Program

Geomorphic rehabilitation, Almaden Reservoir fish passage, and the in-stream enhancement program are discussed generally below. Reservoir and recharge re-operation, Upper Penitencia Creek management, supplemental flows, and monitoring are described in Section 2.3.4 *In-Stream Operations and Maintenance* subheading *Three Creeks HCP Conservation Program Operations and Maintenance Actions*.

All construction-type projects will require heavy equipment including but not limited to bull dozers, dump trucks, excavators, backhoes, water trucks, welding equipment, concrete laying equipment, paving equipment, drilling rigs, and other similar equipment. Construction may include transport and use of rock, other soils, concrete, and metals. Following construction, these facilities will require on-going and periodic maintenance similar to the maintenance of recharge facilities described in this chapter.

### **Geomorphic Rehabilitation**

Geomorphic rehabilitation is proposed in the Three Creeks HCP Conservation Program. Under this activity, certain reaches of study area streams below the reservoirs would be substantially modified to improve fish passage. Enhancement may include physical re-configuration of channels, installation of structures to enhance channel complexity (based on CDFG and NMFS guidelines for salmonid habitat enhancement), and riparian planting. Specific projects may include the following.

- Ogier Ponds separation from the channel.
- Coyote Percolation Pond separation from the channel.
- Channel enhancements the Coyote Canal diversion to downstream of Pond 10b, including separation of the channel from Pond 10b.



- Geomorphic rehabilitation in the Coyote Creek Watershed below Anderson dam. Geomorphic rehabilitation entails implementation of actions to enhance the channel for the benefit of anadromous fish (e.g., channel complexity, shading, etc.).
- Geomorphic rehabilitation in the Guadalupe River Watershed below Calero, Almaden, and Guadalupe dams. Project sites include Guadalupe dam to downstream of the Alamitos diversion dam and the upstream end of Almaden Lake to the confluence of Alamitos Creek and Guadalupe Creek.

Upon completion of project construction, sites will be monitored to ensure the actions are successful. If actions are not successful, adaptive management actions may be applied. All actions related to construction, monitoring, and adaptive management are covered activities under this Plan.

### **Alamitos Creek/Almaden Reservoir Fish Passage**

SCVWD proposes to improve steelhead passage to upstream habitat. One of the goals of this program is to isolate juvenile salmonids emigrating downstream from the lake due to threat of predation. SCVWD has not yet identified preferred approaches to achieve these goals. If selected, trapping fish below the dam would require construction of a fish collection facility at the base of the dam. Fish may also need to be conveyed around the reservoir as they migrate downstream. If selected, this option would require construction of a collection facility on Twin Creek, a tributary of Almaden Reservoir. Under this option, SCVWD would construct an operable dam to divert juveniles from the channel to a collection facility. This location would also likely be the site to release adults migrating upstream that were trapped below the dam and trucked around the reservoir.

Because a design has not yet been identified for this project, coverage under this Plan is conditioned upon additional review and approval by the Wildlife Agencies. For the purposes of the impact analysis, a scenario with the greatest impacts to the covered species (i.e., full construction of a new fish ladder and associated facilities in non-developed land cover types) is discussed in Chapter 4 *Impact Analysis and Level of Take* and provided in **Tables 4-5a and 4-5b**. In addition, SCVWD will apply all applicable avoidance and minimization measures as described in Chapter 6 when implementing a fish passage projects.

### **Gravel Enhancement Program**

Installation of gravel traps in the upstream reaches of Coyote, Anderson, Almaden, and Guadalupe reservoirs (below the high-water line) are proposed. The traps are needed to sort and wash gravel to remove fine sediments to improve spawning habitat for native fish. Washed gravel would then be transported to locations beneficial to fish habitat. Excavation may occur a maximum of one time per year per gravel trap if needed, but is expected to generally occur once every 3 years per gravel trap. The need to conduct excavation depends on the number of storms in a given season, how much gravel comes out of the watershed, and the need for gravel enhancement in downstream locations. Excavation will occur in the summer when the reservoir level has

dropped below the location of the gravel trap such that the gravel trap will be dry. If excavated gravel needs to be stockpiled, placement will avoid sensitive natural communities such as wetlands and serpentine grassland. Whenever possible, existing access roads will be used to transport gravel from the excavation sites to processing facilities in the respective downstream watershed.

The following locations are being considered for the gravel enhancement program. One or more of these locations are expected to be selected:

- Anderson Dam to below Coyote Percolation Pond
- Almaden Dam to Lake Almaden
- Guadalupe Dam to the confluence with Alamitos Creek
- Camden Avenue Drop Structure downstream to the confluence with the Guadalupe River

### **In-Stream Cover Enhancement**

In-stream habitat improvements may be undertaken that may include localized installation of boulders, large woody debris, or biotechnical treatments along stream banks to improve cover and riparian functions for salmonids. Activities may also include removal of exotic vegetation and replanting with native riparian vegetation. To implement these improvements, short reaches of channel may require dewatering and bypass of flow around the construction points. For the purposes of the Habitat Plan impacts analysis, a total of 1 mile of stream is assumed to be enhanced with in-stream cover.

### **Fish Passage Enhancement**

The activity incorporates an on-going program to remove small physical and hydrologic barriers to movement of salmonids and other fish and wildlife. Activities include replacement of small culverts with bridged weir structures to provide access to tributary streams. To implement these improvements, short channel segments may require temporary dewatering or bypass to allow construction.

Use of heavy equipment such as bulldozers, dump trucks, excavators, backhoes, water trucks, welding equipment, concrete laying equipment, paving equipment, and drilling rigs may be necessary for these activities.

## **Dam-Related Capital Projects**

### **Dam Seismic Safety Retrofit**

As discussed above in this chapter, SCVWD operates eight large dams and three small flashboard dams in the study area. This Plan covers the retrofit of four SCVWD dams (Almaden, Anderson, Calero, and Guadalupe dams). Other Permittees, including County Parks, and the City of San José, also operate smaller dams. County Parks operates six smaller dams; five on Grant Lake at Joseph D. Grant County Park, and one on Sandywool Lake in Ed R. Levin

County Park. The City of San José operates Cherry Flat Reservoir. All of these dams are operated under regulation by the California DSOD, a division of the California Department of Water Resources. In addition, Anderson Dam is also regulated by the Federal Energy Regulatory Commission (FERC). DSOD and FERC periodically inspect and evaluate the safety of dams based on current seismic safety standards for the design of dams. If either regulatory agency determines that an existing dam does not meet current safety standards, DSOD or FERC may require either dam retrofit or reduction of the level of water in the reservoir to increase freeboard, thus reducing storage capacity.

As dams within the study area age and as safety design standards become more rigorous, it is likely that several regulated dams in the permit area will require seismic retrofitting within the permit term of the Plan. Retrofitting would not require full reconstruction of the dam, but may require extensive upgrades to dam infrastructure such as intakes or outlets. Retrofitting includes the addition of new fill or features to stabilize a structure, with the existing structure remaining either mostly or somewhat intact. Common approaches to retrofit of earthfill and rockfill dams are described briefly below. These approaches can be used individually or in combination for a specific dam.

- **Strengthening the upstream embankment.** Requires raising the dam and increasing the size and slope of the upstream embankment;
- **Strengthening the downstream embankment.** Requires raising the dam and increasing the size and slope of the downstream embankment; raising the dam and bracing the lower portion of the dam with a "bench" or "berm"; and buttressing the embankment.
- **Strengthening the dam internally.** Installing concrete-type cores in the dam to prevent rupture of the internal zone of the dam and seal the foundation.

Given the age of dam facilities, the length of the permit term, and the potential for major seismic events in the Plan study area, it is reasonable to anticipate that some substantial safety retrofits will be required for each of SCVWD's and County Park's dams. Upgrading of dam embankments to meet DSOD-mandated safety standards (safety retrofit) may involve upstream and/or downstream extension of embankments, dewatering of the reservoir (for any safety retrofit requiring work on the upstream embankment), increases in embankment height to increase reservoir freeboard, and reconstruction of the dam face and associated facilities such as spillways and inlet-outlet facilities. For the purposes of the impact analysis described in Chapter 4, it is assumed that four of SCVWD's eight dams in the permit area, the six County Park dams listed above, and the City of San José's Cherry Flat Dam will require retrofit during the permit period.

### SCVWD Dams

Because there are many construction options related to dam seismic safety retrofits, some limitations were identified to qualify for coverage under this Plan. These limitations were developed to allow for reasonable description of the impacts and also to limit the impacts to covered species. The following activities are not covered by this Plan.

1. Seismic retrofit work that is conducted outside of the footprint assessed in the impact analysis (**Table 4-5a**)<sup>11</sup>.
2. Dewatering events longer than 2.5 years at all reservoirs except Anderson for safety seismic retrofit which will not exceed 3.5 years (dewatering events are further described in the following section).
3. More than one dewatering event at a time conducted per watershed (this includes dewatering required for retrofit and dewatering required for activities described under *SCVWD Dam Maintenance Program* below).
4. More than four dewatering events for seismic retrofit (at Almaden, Anderson, Calero, and Guadalupe reservoirs).
5. More than 14 additional dewatering events for other maintenance activities (at all covered SCVWD dams; described below under *SCVWD Dam Maintenance Program*) over the permit term.
6. New earth or rockfill dams.
7. Expansion of design storage capacity or increase in the reservoir surface level as designed (i.e., no additional area of inundation; the crest of the dam might be raised to increase freeboard, but not to increase storage).
8. Dewatering rates inconsistent with **Table 2-4**<sup>12</sup>.

The schedule for each dam seismic safety retrofit is not known at this time. Retrofits on dams that are currently operating under DSOD/SCVWD interim storage restrictions will be initiated according to DSOD requirements and funding constraints. Retrofits will encompass other major dam repairs, including dam outlets and spillways.

Retrofitting four of the eight dams in the permit area operated by SCVWD (all dams except Vasona, Coyote, Chesbro, and Uvas dams), including a dewatering event that is required as part of retrofitting, is a covered activity under this Plan. An increase in existing reservoir size (i.e., increasing the area of inundation or design capacity) is not covered by this Plan.

### **Borrow Sites**

Borrow sites are locations where earth and rock material are removed for construction purposes elsewhere. The materials needed for dam seismic safety retrofits will vary substantially, depending on the type of retrofit. For all retrofits except concrete-type grouting and similar methods, retrofits will require substantial quantities of earth fill and/or rock fill materials including sedimentary soils, rock of various sizes, and concrete. The quantities, quality, and type of materials needed depend on the specific design of the retrofit; materials must meet rigid performance standards in order to ensure safety.

<sup>11</sup> Because the specific retrofit method for each dam was not known at the time of the impact analysis, the impact analysis described in Chapter 4 and **Table 4-5a** assumes that downstream embankment strengthening would be employed for all dams because it represents the worst-case scenario.

<sup>12</sup> The Wildlife Agencies may require adjustments to maximum flows in **Table 2-4** for future projects based on monitoring results (see *Dewatering Event*) below.

To address this fill requirement, SCVWD will consider obtaining fill from a number of sources, including the following.

- The upstream delta of the reservoir.
- The reservoir.
- Existing quarries.
- New quarries in the reservoir basin, in the canyon below the dam, and in the alluvial plain within the Habitat Plan permit area.

Although SCVWD will prefer to obtain materials from sites near the dam and sites with a low potential for impacts to covered species and their habitats, borrow materials must meet engineering criteria for the dam seismic safety retrofit and this requirement will necessarily limit sources for borrow. SCVWD will use the following criteria to avoid and minimize impacts.

- Use fill from the reservoir delta and basin to the extent feasible.
- Select borrow sites based on general feasibility criteria such as suitability of materials, haul distance, cost, and potential impact to covered species. If two or more potential borrow sites are capable of providing materials that meet geotechnical requirements, select the site with the lowest potential for impacts to covered species.
- Avoid wetlands.
- Avoid sites in areas designated as high or medium conservation priority in this Plan.
- Avoid sites within designated habitat preserves.
- Select haul routes to minimize the potential for traffic to impact special status plants and animals.

Borrow sites will not be located directly in streams or immediately adjacent to streams such that permanent stream impacts would occur, except where the stream is also in a reservoir (consistent with the first bullet above). The following worst case assumptions were used to define the maximum allowable impact covered by this Plan.

- Earth fill will be obtained from locations in the alluvial plain in the north valley area.
- Earth fill excavations will range from 30 to 40 feet deep.
- The side slopes of the borrow pits will be 1 (vertical) to 2 (horizontal) and would add 10% to the permanent impact area.
- The area of temporary impact around borrow areas will equal 30% of the area of excavation.
- Rock fill will be obtained from within the reservoir.

Following use of a borrow area in the alluvial plain, SCVWD may use the site as a recharge area (if it is appropriate for recharge) or it may be converted to other uses such as recreation and environmental enhancement.

Borrow sites developed to support reconstruction of dams in the Habitat Plan study area are expected to be located inside of the permit area of the Habitat Plan. Take associated with borrow sites located in the portion of the proposed Three Creeks HCP permit area that does not overlap with the permit area of the Habitat Plan are possible but are not covered activities under the Habitat Plan and would require authorization through the Three Creeks HCP or another regulatory mechanism. Selection of borrow sites located inside the Habitat Plan permit area covered by the Habitat Plan are subject to Wildlife Agency review and approval during implementation of the Plan (see Section 8.7.3 *Wildlife Agency Responsibilities*).

### **Dewatering Event**

Prior to dam seismic safety retrofit, a reservoir must be dewatered. Once emptied, the reservoir is maintained free, or almost free, of water until construction is completed. The reservoir refills the following winter. In the case of a drought, refilling could take longer. The time between the beginning of reservoir dewatering and when the reservoir is re-operated according to applicable rule curves<sup>13</sup> is called a *dewatering event*. SCVWD expects that up to four dewatering events will be required for safety retrofit of the four SCVWD dams covered for this activity. Four dewatering events are associated with seismic safety retrofits, but multiple dewatering events could occur at a single dam over the permit term. In addition, SCVWD anticipates dewatering may be required for some maintenance activities. These activities are discussed in Section 2.3.4 *In-Stream Operations and Maintenance* subheading *SCVWD Dam Maintenance Program*.

Each SCVWD dewatering event is covered under this Plan for up to 2.5 years except at Anderson Reservoir for implementing a seismic safety retrofit. It is expected that Anderson Dam will require two seasons to reconstruct and thus requires 3.5 years for a dewatering event. If SCVWD anticipates a dewatering event will take more than 3.5 years for seismic safety retrofit at Anderson Dam or more than 2.5 years for any dewatering event at other dams, SCVWD will begin a separate consultation process with USFWS and CDFG and may be required to provide additional mitigation beyond that required by the Habitat Plan.

Timing of a dewatering event varies from reservoir to reservoir due to capacity constraints of each dam's outlet system. However, draining a reservoir generally takes months. Construction will be planned so that the reservoir is ready to begin receiving water again in November after construction or maintenance is completed. The reservoir refilling begins during the following (second) season. The amount of time the reservoir requires to refill depends largely on the weather and if the reservoir is a storage facility for imported water. See **Table 2-4** for

<sup>13</sup> There are multiple types of rule curves by which SCVWD operates its reservoirs and not all of them are for species conservation purposes.

maximum covered release flows from reservoirs for the draining phase of dewatering events.

Before a reservoir is dewatered for the first time (whether for dam seismic safety retrofit or other dam maintenance described in Section 2.3.4 below), SCVWD will prepare a reservoir-specific dewatering plan to minimize impacts to covered species (in particular, California red-legged frog and western pond turtle). This plan will be submitted to the Wildlife Agencies for review and approval<sup>14</sup>. Dewatering plans will be updated prior to subsequent dewatering events during the permit term in the event that a single reservoir is dewatered more than once. Dewatering events involve the following components.

- **Draining.** A period generally between 6 months to 1 year of reservoir releases in excess of then-current flow targets. The SCVWD will specify the timing, frequency, and duration of reservoir releases in each dewatering plan.

Maximum covered release flows were developed to be higher than the flows which will be implemented by SCVWD and are provided as a maximum flow release covered by the Plan.

If, at the time of developing a dewatering plan, SCVWD determines the flow releases will be higher than those in **Table 2-4**, additional consultation with the Wildlife Agencies will be required and additional mitigation may also be required.

The effects of stream flow regulation on amphibians and reptiles are poorly understood. If California red-legged frog western pond turtle, or yellow-legged frog populations are found in streams hydrologically affected by existing dams in the permit area, the Implementing Entity will monitor the effects of flow regulation (including dewatering events) on the species as specified in (Section 7.3.3 *Species-Level Actions*). Effects of draining will be documented and reported to the Wildlife Agencies within 60 days of the conclusion of each dry season and wet season dewatering event. After coordinating with the Implementing Entity, the Wildlife Agencies may require an adjustment in the maximum reservoir release flows in **Table 2-4**. For example, if targeted studies show that maximum reservoir release flows allowed during the wet season scoured a significant amount of California red-legged frog egg masses, the Wildlife Agencies may require that the maximum covered reservoir release flow be decreased from those currently specified in **Table 2-4** for future projects on that facility. Conversely, if monitoring data suggests that reservoir release flows described in **Table 2-4** are not having adverse effects on covered species, flows may be increased with Wildlife Agency approval.

- **Construction/repair.** A period of about 6–8 months when the reservoir will be dry, and natural inflow and groundwater upwelling will be bypassed around the dam for release to the downstream channel. The entire footprint

<sup>14</sup> Chapter 6, Condition 4 *Avoidance and Minimization for In-Stream Projects*, subheading *Requirements for SCVWD Dewatering Events* requires a dewatering plan to be approved by the Wildlife Agencies. Condition 4 also identifies the minimum required content of a dewatering plan and avoidance and minimization measures that may be applied. See Chapter 8, Section 8.7.3, subheading *Additional Review* for details of the review process.

of the dry reservoir may or may not be continuously disturbed during this time.

- **Refilling.** A period when the reservoir is re-filling and downstream flow may be limited to a combination of bypass flow and supplemented flow (if supplemental flows are provided) because water levels have not yet reached the elevation of the outlet and to allow the reservoir to fill as rapidly as possible. If there is a dry year following construction/repair, then the period of re-filling may extend beyond one winter season.

Construction and operation of supplemental water supply systems that may be implemented as a covered activity during dewatering events is discussed below under *Three Creeks HCP Conservation Program Operations and Maintenance Actions*.

### County Parks Dams

County Parks anticipates that each lake may require dam retrofit once within the permit term. Up to one dam at Sandywool Lake and up to five dams at Grant Lake may be retrofitted during the permit term. The existing dams are earthen dams. The dam at Sandywool Lake has rip rap armoring to protect from erosion related to wave action. Dams will be reconstructed within the same footprint of the existing dam and will remain earthen unless DSOD requires alternative materials. Repair or maintenance may include embankment strengthening on the downstream side of the dam.

These dams are considerably smaller than SCVWD dams and each dewatering event (i.e., draining, construction, and refilling) is expected to take up to 3 months, although it could be as little as 1 month. Construction will occur during the summer. Lakes will require dewatering prior to construction activities. Work will be performed when each lake is at its lowest level. Sandywool Lake is fed by a pipe from Calaveras Reservoir. Inflows would be shut off at the inflow valve and, through use of reservoir water for irrigation, the water level of the lake allowed to dewater below the level necessary to perform the construction. It is expected that a small pool will be maintained in the lake during construction to support irrigation of park turf and golf courses. Sandywool Lake feeds a small tributary to Arroyo de los Coches, a tributary to Berryessa Creek. While Sandywool dam does have a spillway to Arroyo de los Coches, it does not have outlet valve and does not provide annual flow to local streams. Thus, dewatering is not expected to affect the water supply for local streams.

Grant Lake is fed by overflows from McCreery Lake via a historic canal system. Dewatering would occur by pumping because the lake has no outlet valves. The lake would be dewatered only to the level required to perform the work and a minimal pool will be maintained. Because Grant Lake only receives overflow from McCreery Lake, and McCreery Lake only overflows during winter storm events, no inflows to Grant Lake are expected during the construction period. Grant Lake is not located on a stream, but it does have a drainage connection to Arroyo Aguaque Creek, a tributary to Upper Penitencia Creek, via the dam's spillway. Dewatering is not expected to affect the water supply for local streams.



Both lakes would refill naturally the following winter and through the existing systems supply systems.

Because these reservoirs are relatively small and downstream water supplies are not expected to be affected, dewatering plans for review by the Wildlife Agencies are not required.

Borrow sites will be sited in the California annual grassland land cover type or in other already disturbed areas. Whenever possible, borrow sites will be used to create habitat for covered species (e.g., a pond for California tiger salamander). Location of borrow sites will be within County parks, but exact locations are unknown at this time. Borrow sites will be subject to Wildlife Agency review and approval during implementation of the Plan (Section 8.7.3 *Wildlife Agency Responsibilities*).

### **City of San José Dam**

The City of San José anticipates that the dam at Cherry Flat Dam may require safety retrofit within the permit term of the Plan. Similar to the County Parks dams, this dam is much smaller than the dams maintained by SCVWD. The dewatering event (i.e., draining, construction, and refilling) is expected to take up to 4 months, although it could be as little as 1 month. The reservoir will require dewatering prior to construction activities. Cherry Flat Reservoir is located on Upper Penitencia Creek. This reservoir is not currently managed to support fish flows in Penitencia Creek, although it is managed to maintain minimal flows through Alum Rock Park (approximately 0.5 cfs) during summer months. Reoperation of the reservoir for fish management is included as a conservation measure in the proposed Three Creeks HCP Conservation Program (described below). Because this reservoir is relatively small, a dewatering plan for review by the Wildlife Agencies is not required.

Cherry Flat Reservoir receives water from the upper watershed of Upper Penitencia Creek. The watershed above the reservoir is relatively small (2.4 acres). During a wet year, the reservoir may refill in one season. It may take more than one winter to refill the reservoir during drought conditions.

The borrow site for this project will avoid sites in areas designated as high or medium priority for conservation in this Plan. Borrow sites will be subject to Wildlife Agency review and approval during implementation of the Plan (see Section 8.7.3 *Wildlife Agency Responsibilities* for details).

### **Dam Instrumentation Project**

SCVWD's Dam Instrumentation Project is a capital project that requires installation of new instrumentation at the eight dams in the permit area. This includes the installation of piezometers, inclinometers, survey monuments, real-time monitoring systems, seepage collection systems, reservoir level gauges, and seismographs. Activities also include a field geotechnical exploratory drilling program and providing a corresponding Automated Data Acquisition System for the eight SCVWD dams within the study. Installation of equipment and

exploratory drilling may require access road grading and restoration, drilling, trenching, excavation and backfilling, electrical work, supervisory control and data acquisition (SCADA) system work, and concrete work.

Guadalupe, Anderson, Vasona, Calero Auxiliary dams currently do not have seepage collection systems installed but will likely require such systems to be installed within the permit term. These new systems would be installed within the footprint of the Dam Maintenance Program (described below under *In-Stream Operations and Maintenance*). In addition, any dam that is seismically retrofitted in a downstream direction would require installation of a seepage collection system, although this system would be installed within the footprint of the retrofit.

The work will occur within the identified Dam Maintenance Program footprints and many of the activities associated with this task are also conducted as part of the Dam Maintenance Program. Most of these activities will be conducted on the dams and, to a lesser degree, on the abutments. There is the potential for impact to non-developed land cover. However, because these activities are conducted in the footprints of the Dam Maintenance Program, no additional impacts are assessed for implementation of the Dam Instrumentation Project. Maintenance of dam instrumentation is discussed below in Section 2.3.4 *In-Stream Operations and Maintenance* subheading *Dam Maintenance Program*.

## **In-Channel Groundwater Recharge Facilities**

The following two projects involve rehabilitation and expansion of off-channel groundwater percolation ponds and associated diversions facilities. These systems require: 1) an in-channel diversion dam that pools water, 2) an outlet structure to transport water from the stream channel to the pond, and 3) an off-channel groundwater recharge pond. To provide flow to the off-channel ponds, an in-channel dam is constructed. Historically, this may have included a gravel berm placed across the channel annually, or a permanent in-channel structure. New or replacement temporary diversion structures placed under this Plan will consist of operable (inflatable) dams that can be deflated during times of year when fish passage is most critical. A diversion (outlet pipe or canal) is constructed upstream of the dam in the pool. When water backs up behind the dam, gravity moves water from the pool into the diversion and then into the off-channel percolation pond.

### **Ford Road Groundwater Recharge Pond and New Diversion Dam at Metcalf Road**

SCVWD may propose re-operation of the existing off-stream Ford Road Pond, and expand the site to include up to three additional ponds (for a total of four ponds). Re-operation would only include the existing pond, not the in-channel diversion that was once used to provide flows to the pond. The project site is located between U.S. 101 and Hellyer Avenue, south of Piercy Road and

immediately north of the Coyote Creek Trail, adjacent to Coyote Creek. The project site is approximately 19 acres, including the existing off-channel pond.

As a result of isolating Ogier and Coyote recharge ponds from the main channel of Coyote Creek (a covered activity identified above under *Three Creeks HCP In-Stream Capital Projects*), the area of on-channel percolation will be reduced and SCVWD may need to install a new diversion facility to move flows to off-channel recharge ponds in order to maintain the same level of water diversion to the groundwater basin. If needed, this new diversion would be installed along Coyote Creek at Metcalf Road. In addition, a new pipeline would be constructed that would provide water to the newly isolated Coyote recharge pond and the new Ford Road ponds (both ponds will be served by one diversion and pipeline). The diversion facility may require a seasonal operable (inflatable) dam to create an in-channel ponded area to provide flows to the diversion. If utilized, this dam would also include a fish ladder. Design of the diversion will be coordinated with CDFG for issues related to anadromous fish impacts and because this project will require a streambed alteration agreement. Impacts evaluated in Chapter 4 assume the worst case that a new operable dam, diversion, and pipeline will be installed.

Reoperation of Ford Road ponds is not expected to change flows downstream of the Coyote recharge pond/Ford Road pond complex. If, when the project is ready to be implemented, SCVWD identifies a change in downstream flows due to re-operation of Ford Road pond that may affect the covered species, additional consultation with the Wildlife Agencies will be required that may result in additional minimization and/or mitigation measures.

## Church Avenue Groundwater Recharge Ponds

SCVWD may propose the re-operation of off-stream Church Avenue Ponds. The Church Ponds consist of three ponds located on 57 acres near the intersection of Llagas Avenue and Church Avenue in San Martin. The ponds border the west side of Llagas Creek and are separated from the creek channel by a levee. The ponds have a total surface area of 42 acres. One percolation pond is located directly north of Church Avenue, another pond directly south of Church Avenue, and the third pond is located southeast of the pond south of Church Avenue. The project requires replacement of the existing in-channel diversion along Llagas Creek to supply water to the pond. The final design has not yet been determined, but it may include installation of an operational dam (i.e., inflatable rubber dam) with a permanent fish ladder structure. Design of the diversion will be coordinated with CDFG to address issues related to anadromous fish impacts and to meet the requirements of a streambed alteration agreement.

As described in *In-Stream Operations and Maintenance* subheading *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds*, Church Avenue Ponds will divert flows from Llagas Creek when reservoir capacity allows, consistent with fish flow and on-channel recharge requirements. Reoperation of Church Avenue ponds is not expected to change flows downstream of the Church Avenue pond beyond that anticipated in *In-Stream*

*Operations and Maintenance* subheading *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds*. If, when the project is ready to be implemented, SCVWD identifies a new change in flow that may affect the covered species, additional consultation with the Wildlife Agencies will be required that may result in additional minimization and/or mitigation measures.

## **New Bridge Construction and Replacement/ Rehabilitation**

All of the Local Partners operate and maintain bridges within the study area. For example, VTA maintains approximately 10 light rail bridges in San José. The lifespan of a typical bridge is approximately 50 years. Therefore, over the course of the 50-year permit term, it is expected that every bridge within the permit area will likely need major repair or replacement. Similarly, as development within urban areas progresses, new bridges will likely need to be constructed. New and rehabilitated bridges will be designed to federal and state guidelines at the time of construction. In most cases, reconstructed bridges will be wider than the bridges they replace in compliance with changing regulations. Some roads may be widened to accommodate growth in vehicular traffic, bicycles, and pedestrians. Road widening will require adding imported borrow and new asphalt, concrete, and aggregate base for pavement. Where structurally and financially feasible, bridges will be constructed as free-span bridges. Where free-span bridges are not feasible, bridges will be built on pile foundation, cast-in-drilled-hole pile, or spread footing foundations. Excavation for foundations may be required. Slope paving will be included in the scope of work to protect/improve channel slopes at the bridge. County road projects that occur at a stream crossing with a span less than 20 feet are almost always designated as a culvert (D. Cameron pers. comm. a). When culverts are installed, they will be designed and constructed to pass a 100-year flood event as described in Chapter 6. Major bridge repair and rehabilitation may be similar to bridge replacement in scope, often requiring roadway widening, new deck support structures, and seismic retrofitting. The construction of up to 270<sup>15</sup> new bridges, as well as repair and replacement, including expansion, of all existing bridges within the permit area one time during the permit term, is a covered activity of this Plan.

## **Streamside Trails and Crossings**

Several of the Local Partners and the Open Space Authority lead or participate in programs to install trails. New trails are sited outside of the in-stream area to the extent possible to avoid affects on riparian vegetation and streams. However, some trails will need to cross streams and will require installation of bridges or other types of crossings. Trails may also be implemented as a component of

<sup>15</sup> This includes rural residential development but does not include non-bridge creek crossings installed by County Parks along single-track trails.

other types of projects such as flood protection projects or levee reconstruction. In such cases, trails will generally be sited along maintenance roads or in other disturbed areas and will not result in additional impacts beyond those attributed to the main project. The Clean, Safe Creeks and Natural Flood Protection program described above is one such program that supports development of trails into other projects. Streamside trail projects will be a covered activity under this Plan. For more details on trail projects as a covered activity, please see Section 2.3.5 *Rural Capital Projects*.

## 2.3.4 In-Stream Operations and Maintenance

Activities within streams are those activities or projects that occur in or immediately adjacent to streams and adjacent riparian vegetation that may result in impacts on a stream or canal. This may include activities at dams, reservoirs, and on-stream ponds. This category includes operations and maintenance activities in the stream channel, along the stream bank, and adjacent lands at top-of-bank within the riparian corridor, including maintenance of access roads and trails. These covered activities occur in both urban and rural areas. This section discusses operations and maintenance activities in or adjacent to streams.

### Facility and Stream Maintenance

The majority of identified operations and maintenance activities within and adjacent to streams are undertaken by SCVWD, which is responsible for maintaining its facilities. As described earlier, SCVWD is responsible for approximately 35% of the linear distance of all streams within the permit area. As described below, activities conducted by SCVWD under its Stream Maintenance Program are not covered by this Plan and its permits. Specific activities conducted by SCVWD covered under this Plan are described in detail below. Other Permittees also conduct activities within streams, often on properties they own separately. For example, County of Santa Clara Department of Parks and Recreation is responsible for routine maintenance within County parks, including properties leased by the County for parks. The Cities of San José, Gilroy, and Morgan Hill also maintain some stream segments within their jurisdictions. The following operations and maintenance activities within streams are covered by this Plan. Most of the activities listed below will be conducted by the cities, County Parks, the Open Space Authority, and County Roads and Airports Department for stream segments not maintained by SCVWD through the Stream Maintenance Program.

- Facility maintenance such as trail repair; trash removal; installation of fences; accumulated sediment removal (see following section for additional discussion); trail, road, and culvert repair or replacement; and minor bridge repair.
- Storm system maintenance including clearing outlets in order to ensure unrestricted storm water flow. Work may entail trimming vegetation and/or clearing sediment around drain outlets.

- Storm damage repair and flood prevention projects including drainage improvements.
- Natural resource protection such as small bank stabilization projects (less than 100 feet), restoration to reduce erosion, and removal of debris deposited during flooding.
- Small-scale erosion control projects or storm damage prevention projects that do not create new permanent hardscape on the creek bank or channel. This category includes temporary flood-fighting activities to prevent storm damage (e.g., sandbagging).
- Operation and maintenance of flood protection facilities such as armored creeks, bypass channels, levees, access roads, and detention ponds.
- Fish screen installation and removal of fish barriers such as in-stream concrete low-flow crossings and culverts.
- Vegetation management for exotic species removal, such as removal of giant reed, and planting of native vegetation.
- Vegetation management for public safety hazards including fire management and mosquito control activities.
- Stream gauge station maintenance upstream of reservoirs.
- Operations and maintenance of water utility/water supply facilities including flashboard or inflatable dams, diversion structures, groundwater recharge ponds, gauges, pipeline blowoffs, turnouts, drop structures, weirs, fish ladders, etc.
- Sediment removal, including mercury remediation incidental to the sediment removal.

Operations and maintenance activities associated with habitat enhancement and restoration that will be conducted inside and outside the Reserve System are identified in Section 2.3.8 *Conservation Strategy Implementation*.

## Sediment Removal and Mercury Remediation

Removal of accumulated sediment is a covered activity under this Plan. Due to historic mining practices in some portions of the study area, sediment in some of the streams in the study area (e.g., Guadalupe River and its tributaries) may contain detectable levels of mercury. Current regulations require that sediment be tested for contaminants, including mercury, before it is used elsewhere in the watershed or distributed to a landfill. Sediment that tests positive for mercury will be disposed of in a hazardous materials facility. Although mercury remediation is undertaken through some sediment removal projects, mercury remediation is not the primary goal but rather a result of proper and regulated sediment disposal. Sediment removal activities undertaken as part of routine stream maintenance that also remove mercury from streams and are conducted by

Local Partners other than SCVWD are covered by this Plan<sup>16</sup>. Activities undertaken with a primary goal of mercury remediation are not covered by this Plan (see Section 2.4 *Projects and Activities Not Covered by this Plan* for additional detail).

## Santa Clara Valley Water District

SCVWD has in place or is developing other permitting programs to obtain necessary incidental take permits for operation and maintenance activities. In 2002 SCVWD received permits to implement the Stream Maintenance Program which provides ESA coverage for routine stream maintenance (see Section 2.4 *Projects and Activities Not Covered by this Plan* for additional detail). The non-routine stream maintenance activities described below are covered only by this Plan. As discussed above, SCVWD is also currently developing the Three Creeks HCP. Certain activities covered under the Three Creeks HCP are also covered by this Plan as described in this chapter. SCVWD is also currently developing a Dam Maintenance Program (described below). Implementation of the Dam Maintenance Program is a covered activity under both the Three Creeks HCP and the Habitat Plan as pertains to their respective study areas (**Figure 2-5**).

### Reservoir Operations under DSOD Interim Storage Restrictions

As discussed above in Section 2.3.3 *In-Stream Capital Projects*, SCVWD and the DSOD regularly evaluate the status of SCVWD dams to ensure their continued safety. If a potential safety concern is identified, SCVWD reduces storage until the concern can be addressed. Known as *interim storage restrictions*, these voluntary reductions in storage affect water supply operations (management of reservoirs and ground water basins). In particular, they place an increasing emphasis on wet-season recharge so that SCVWD can capture as much inflow from storms as possible and retain as much of the reduced storage capacity of the reservoir for dry season recharge. Most of SCVWD's dams (all but Vasona, Uvas, and Chesbro) have been operating with storage restrictions for approximately 12 years.

As of December 2011, SCVWD and DSOD agreed to increased storage restrictions (additional reductions) on Anderson, Calero, and Guadalupe reservoirs. Storage restrictions were not changed for Almaden and Coyote reservoirs. No interim storage restrictions are currently in place for Vasona, Chesbro, or Uvas reservoirs. Current interim storage restrictions are shown in **Table 2-5**.

From the date that DSOD issues a storage restriction to re-operation of the reservoir post safety retrofit, the process to implement a retrofit may take several

<sup>16</sup> SCVWD's Stream Maintenance Program provides coverage for minor mercury remediation associated with sediment removal.

years due to design review requirements, financing, and environmental reviews; therefore interim storage restrictions are likely to be in place until SCVWD is able to implement repairs to DSOD standards (which may require seismic retrofit).

Over the last 12 years of DSOD storage restrictions, SCVWD has operated some reservoirs according to rule curves for special-status fish species, and SCVWD expects that these requirements will continue (see *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds and Three Creeks HCP Conservation Program Operations and Maintenance Actions* below). If SCVWD is not able to meet these rule curve requirements, developed in coordination with NMFS and CDFG, due to future increases in DSOD storage restrictions (including new storage restrictions on dams currently without restrictions), and dry-back in channels below reservoirs increases substantially over current conditions, then SCVWD will begin a separate consultation process with USFWS and CDFG and may be required to provide additional monitoring and/or mitigation beyond that required by the Habitat Plan.

## Recharge Operations and Maintenance

In the channels below the reservoirs, SCVWD operates and maintains in-channel and off-channel recharge ponds and associated facilities. SCVWD operates and maintains the following types of facilities:

- In-channel diversion dams, diversions, weirs, and drop structures with associated fish ladders, fish screens, distribution ditches, inter-pond pipes, and recharge basins;
- Streamflow gauges and associated equipment; and
- Pipeline turnouts where water is released into creeks.

This infrastructure is entirely located downstream of reservoirs and dams, or on tributaries of reaches downstream of dams. The operation of this infrastructure may result in small levels of take of covered species and is described below. Maintenance includes inspection, cleaning, periodic sediment removal, debris removal, on-going placement and removal of flashboard panels, and similar activities. Maintenance may be required as a result of flood damage, debris damage, seismic events, or other changed or unforeseen circumstances. These facilities may be modified and may require significant redesign, refurbishment, or replacement once in 50 years. Maintenance, repair, and replacement may involve a range of activity intensities, from minor work in the channel with hand tools to more extensive work that may involve work in the channel and in adjacent terrestrial habitats using construction equipment. During refurbishment and/or replacement activities may include removal of existing structures, excavations, placement of concrete, and re-construction of structures including metal work. These activities may require heavy equipment to access and work in the channel. Permanent access roads will be constructed and maintained, and there will be hardscaped facilities on concrete pads.



Maintenance of facilities includes modification to the facilities, within the construction footprints defined, that enhance safety or operations. In three locations, SCVWD proposes to replace current flashboard dams (which cannot be operated on a daily basis) with operable dams that would allow dams to be raised and lowered on a daily basis without compromising safety. Various configurations will be evaluated. From May 1 through October 31, the operable dams would be used in a manner consistent with current practices; the ability to change dam operations on a daily basis would change operations from November 1 through April 30, when at present the dams are either removed or left in place. This shift in operations would alter hydrology during the period from November 1 through April 30 and would affect the height and configuration of the dams, the depth of ponding, and duration of ponding behind the dams.

SCVWD operates about 320 acres of off-channel and on-channel recharge basins in the Three Creeks HCP study area, and approximately 50 acres in the Uvas and Llagas watersheds. Recharge ponds are generally surrounded by levees or were converted from gravel mining operations and are partially below grade. The ponds are linked to the adjacent channels via weirs and overflow spillway or overflow standpipes and pipelines so that, when necessary, water may be discharged from the ponds to the channel. Discharges are made when inflow to the ponds exceeds the capacity of the ponds, which generally occurs when flow through the ponds is constrained by debris build up at a gate, stormwater overflow, or other problems; the pond elevation rises in response and the water flows through the overflow pipelines or over weirs to the channel. This occurs only infrequently at all locations other than Upper Penitencia Creek, where SCVWD routinely makes releases to the upper ponds from the South Bay Aqueduct and a portion of these releases is then passed through the ponds to the channel for in-channel recharge.

Ponds and associated facilities are maintained routinely; major repair and maintenance typically occurs on a 2–10 year cycle. Rodent control is conducted as needed to protect levees, pond slopes, and access roads. The levees are repaired, the ponds are drained, 2–6 inches of fine sediment on the bottom of the ponds is removed. Pond maintenance includes use of heavy equipment such as scrapers, dozers, back hoes, cranes, loaders, dump trucks, and other earth moving equipment. Spoils are removed and used as fill or disposed of outside of the area. No sediment is released to the channel. The perimeter roads are repaired and graded, the gates are cleaned and repaired, and pipelines, debris screens, and other features are repaired. Repair of facilities such as gates, pipelines, and pumps may require metal work and use of concrete, chemicals, and asphalt.

Vegetation management is also needed on properties adjacent to the percolation ponds. Aquatic vegetation must be controlled within the ponds, and buildup of algal mats must be removed to maintain percolation rates. The entire footprint of the ponds is thus routinely completely disturbed. When ponds are drained nonnative fish, reptiles, and amphibians in the ponds will be removed and disposed and native species may be relocated as described in Condition 4 (see Section 6.4.2 *In-Stream Projects* subheading *Condition 4. Stream Avoidance and Minimization for In-Stream Projects* for additional detail).

In addition to currently operational recharge areas, SCVWD is proposing to re-operate the off-stream Ford Road Pond located on Coyote Creek and Church Avenue Ponds, and to construct up to four new off-channel recharge ponds. The Ford Road and Church Avenue ponds are described above in Section 2.3.3 *In-Stream Capital Projects* and the four new off-channel ponds are described in Section 2.3.5 *Rural Capital Projects*.

SCVWD diversion dams are semi-operable; that is, they have fixed panels (flashboards) that may be removed at times, but the removal process is time consuming and both difficult and a safety concern during high flows. Removing the fixed panels is generally accomplished with a crane operating from the bank and a backhoe or other heavy equipment operating in the channel and removing the panels to the crane. In general, SCVWD removes flashboards prior to the first storm that may pose a flood threat, and the flashboards are then not replaced until the likelihood of major storms has passed. Depending on the magnitude and timing of precipitation, flashboards may be left in place year round in a dry year or, in a wet year, removed early and reinstalled late. When flashboards are removed, diversions are negligible.

Diversions dams are subject to high flows, debris damage, and general wear and tear. Diversion dams are routinely maintained and various components are replaced. It is anticipated that recharge operations facilities will be replaced, on average across all facilities, once during the permit term of the Habitat Plan. Diversion facilities may be reconstructed as operable dams. Operable dams will be either be inflatable (otherwise known as rubber dams) or will consist of panels that can be raised and lowered remotely. Inflatable dams can be operated in “real-time” during the wet season, thus allowing diversions where flooding is not a concern and for conservation purposes (e.g., flushing sediment, allowing fish passage, etc.). Replacement diversion facilities will not have a substantially different footprint (within 10%) from the existing facility nor will replacement substantially modify the maintenance footprint. Operable dams will be constructed on a sloped concrete bench that will be designed to allow fish passage when the dams are down.

Recharge operations require measurement of stream flow at various locations. This is accomplished using a system of stream flow gauges which are simple fixed structures set across the channel. Operation of these gauges involves routine inspection and repair, a relatively low impact operation. Replacement of such small facilities involves more intensive construction work, as described for all facilities above. SCVWD may also install up to 10 new stream gauges to ensure proper management of stream flows. SCVWD has also installed a number of drop structures which are part of the program to reduce flood potential. These can range from vertical concrete walls or stepped facilities. Drop structures are laddered to promote fish passage at some locations. Finally, SCVWD has release valves for a number of pipelines along the channels which function as release points to drain pipelines during maintenance and/or when pipeline pressure increases and must be relieved to avoid pipeline damage. These “blow-off valves” may need routine maintenance. This routine maintenance is also part of the Pipeline Maintenance Program described below under Section 2.3.6 *Rural Operations and Maintenance*.

SCVWD releases imported water at stream turnouts for flow augmentation to Coyote Creek from the Santa Clara Conduit, Los Gatos Creek from the Central Pipeline, and Calero/Alamitos/Guadalupe Creeks from the Almaden Valley Pipeline.

Maintenance work associated with pipelines is part of SCVWD's Pipeline Maintenance Program, described below in Section 2.3.6 *Rural Operations and Maintenance*.

## **Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds**

SCVWD, in conjunction with NMFS, CDFG, and other local stakeholders, has developed a preliminary set of draft principles to guide operation of Uvas and Chesbro dams to benefit steelhead trout (National Marine Fisheries Service et al. 2009). Operations of these dams are considered together because Uvas and Chesbro dams have been operated in tandem and are linked through a gravity pipeline in which water from Uvas Reservoir can be transferred into Llagas Creek to supplement groundwater percolation in that watershed. The overall objective of the operating strategy is to restore and maintain healthy steelhead populations within Uvas Creek, recognizing that Llagas Creek is extremely flow-limited under most years for steelhead production.

One of the outcomes of the draft principles was a detailed set of “rule curves” to guide the operation of these dams and conservation actions implemented for the benefit of steelhead trout.<sup>17</sup> The rule curves identify different release rates depending on how many acre-feet of water are stored in the reservoir at a specific point in time. These curves were derived from the estimated probability of future stream flows expected on any particular date, based on a statistical analysis of historical stream flow data. In wet years, the full range of releases are available to provide for winter attraction, spring out migration (highest fisheries priority), and summer rearing for steelhead trout. Under less favorable hydrologic conditions, the rules allow for the adjustment of releases to meet the remaining flow priorities for steelhead trout. Operating rules provide for water transfers from the Uvas watershed for percolation in Llagas Creek and Church Avenue groundwater recharge ponds only when there is water to meet all flow requirements in Uvas Creek, including adequate reservoir carry over storage for releases into the next season. The modified rule curves were intended to adjust the release schedule of and between the two reservoirs, relative to the historic prescribed operation (defined by a 1956 Memorandum of Agreement with CDFG) to ensure the steelhead population management is optimized between the two systems.

These management activities may have both beneficial and adverse effects on covered amphibians and reptiles and are covered activities under this Plan.

<sup>17</sup> These preliminary rule curves are detailed in the *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds* (National Marine Fisheries Service et al. 2009). This document has not been formally adopted by SCVWD or approved by NMFS.

- **Timing of Transfers to Llagas Creek.** SCVWD may transfer Uvas Reservoir water to Llagas Creek only if winter, spring, and summer flow targets can also be met in Uvas Creek. Transfers will be delayed to late summer and fall.
- **Smolt Out-Migration.** SCVWD may provide releases from Uvas Reservoir in April and May (depending upon available water on April 1). Flows may be pulsed to improve outmigration. To maintain assurance that summer flows can be met in Llagas Creek, no outmigration pulses of reservoir storage will be made to Llagas Creek from Chesbro Reservoir. Local seasonal runoff and flood management releases will be the source of pulse flow and hydraulic connectivity.
- **Summer and Fall Releases.** Releases of about 14 cfs from Uvas Reservoir maintain flows downstream to about West Luchessa Avenue (with about 2 cfs flow at Miller Avenue). These releases are able to be percolated into the groundwater basin for water supply. Releases greater than 14 cfs usually extend the flow further downstream to areas where percolation does not enter the groundwater basin for use as future water supply. However, the extent of wetted channel produced by different reservoir releases varies with season, due to accretion by tributary and groundwater inflow, transpiration use by riparian and terrace vegetation, and extent of groundwater pumping. Releases can vary with accretion, so that rearing flows are maintained to a specific point on the stream (target is West Luchessa Avenue). Releases will be increased or decreased as necessary to maintain a live stream to that point, rather than providing a constant release that would result in early and late season expansion of the wetted zone and late summer dry backs to a significant portion of the channel.

Releases from Chesbro Reservoir will maintain summer and fall flow downstream to about the Church Avenue percolation facilities. These releases are able to be percolated into the groundwater basin for water supply and maintain a consistent extent of wetted creek for fish during the dry summer months. If reservoir storage is available an additional release or diverted volume can augment flow, in-stream and be diverted into the Church Avenue percolation ponds. The Church Avenue off-stream recharge diversions will be adjusted as necessary to maintain the maximum the extent of flow between the dam and the Church Avenue percolation facilities. All releases are managed by a set of operational priorities that seek to maintain a consistent and sustainable maximum flow extent during the dry summer for fisheries management and water supply.

- **Rearing Habitat Quality.** If storage in Uvas Reservoir is sufficient, SCVWD may maintain summer and fall (June–December) stream flow to West Luchessa Avenue. The extent of wetted stream channel and the flow to the Church Avenue diversion may be reduced compared to the historic channel conditions based on the reduced amount of water available for transfer from Uvas. Augmented flows from Chesbro that are maintained to the Church Avenue percolation facilities and diverted off-channel for groundwater percolation will maintain improved stream conditions relative to flows that only make it to Church Avenue.

- **Winter Attraction Flows.** If rule curves indicate sufficient water, SCVWD may provide for periodic winter pulse releases from Uvas Reservoir of in each winter month (January, February, and March) to provide for adult steelhead attraction and migration. Reservoir operations on Llagas Creek may include winter base flow release management but other than flood management releases do not include specific winter pulse releases from Chesbro Reservoir. The available water is managed to provide reliability of making fall carryover storage target and the highest priority summer, then spring and winter releases to Llagas Creek.
- **Fine Sediment and Flow Attenuation.** SCVWD may, consistent with flood control needs, reduce or eliminate flood releases in order to increase the frequency of moderate floods to scour the channel, transport sediment, and reduce encroachment into the channel by riparian vegetation.
- **Carryover Volume.** SCVWD may maintain a target carryover volume in Uvas Reservoir to provide for winter and/or spring stream flows in drought years. Chesbro Reservoir may be managed to provide reliability in making the carryover storage target and the highest summer, then spring and releases to Llagas Creek.
- **Dry Years.** In dry years not all seasonal stream flow goals can be met. Operational priorities are applied to Uvas and Chesbro reservoir management when insufficient water is forecast to meet flow objectives. The Operational priorities provide an orderly trade-off of life-history support for steelhead trout based on available water and degree of risk to the population management outcomes of the operational rules applied in each system. When necessary, the step-wise trade-off will be managed in a collaborative discussion with the Wildlife Agencies.

## Dam and Reservoir Maintenance

Dams and reservoirs operated by SCVWD, County Parks, and the City of San José require routine and corrective maintenance to ensure their proper inspection, functioning, and safety. SCVWD operates eight dams in the permit area, as well as Coyote Percolation pond. County Parks maintains six dams, one at Sandywool Lake and five at Grant Lake. The City of San José maintains Cherry Flat dam. Dam and reservoir maintenance activities are described below.

The Plan assumes that the entire dam face and abutments will be permanently affected (see Chapter 4 for additional detail on impacts). In addition, vegetation management may be required around the perimeter of the reservoir in areas where the water level has decreased due to annual fluctuations. Removal of debris accumulating at the dam and along the perimeter of the reservoir may also be required. Debris removal may require use of cranes and other heavy equipment operated from the dam and/or in the temporarily dry area of the reservoir that is created by fluctuating water levels.

Reservoirs may also require dredging to remove sediment in order to maintain reservoir function and capacity. This activity will take place within the reservoir

basin and will utilize existing roads and disturbed areas for access and staging. Some reservoirs may have oxygenation systems installed. These systems require routine maintenance and may also require replacement.

For SCVWD, this activity does not include dewatering of the downstream channel except as related to dewatering events as described briefly below and in more detail above in Section 2.3.3 *In-Stream Capital Projects* subheading *Dewatering Event*. For County Parks and City of San José, dewatering of reservoirs is not anticipated beyond normal use and operation of the reservoirs (e.g., typical annual fluctuations in reservoir levels) and is not required for this activity.

### **SCVWD Dam Maintenance Program**

SCVWD's Dam Maintenance Program identifies operations and maintenance activities required to maintain the 10 dams, as well as Coyote Percolation and Rinconada percolation ponds, within SCVWD jurisdiction. Eight of these dams—Almaden, Anderson, Calero (including Calero main, auxiliary, and Fellows Dike), Chesbro, Coyote, Guadalupe, Uvas, and Vasona—and Coyote Percolation pond are located within the study area. Implementation of the Dam Maintenance Program for the eight dams located in the permit area and for Coyote Percolation pond is covered by this Plan.

SCVWD's dams and reservoirs require routine and corrective maintenance to ensure their proper inspection, functioning, and safety. Typical conditions that affect dam safety and function include:

- Normal wear of facilities caused by operational wear-and-tear, corrosion, sediment build up near the dams, scour effects, fire, wind and water erosion, seepage through the dam, wave action, and debris accumulation and other factors;
- Damage due to debris, high flows, seismic events and other factors;
- Damage due to vandalism and other human activity; and
- Damage due to burrowing animals and deep-rooted plants.

SCVWD also needs to maintain reservoir capacity and to provide native gravel for conservation measures in the channels downstream of the dams, and thus needs to establish and maintain gravel/sediment traps and access roads to these facilities in the upper ends of the reservoirs.

SCVWD conducts routine and preventative maintenance at dams and reservoirs on an on-going basis, year round. Some maintenance cannot be accomplished without dewatering the reservoir because it may be unsafe to make required major repairs using divers and repairs may require more comprehensive efforts than can be accomplished with divers, such as replacement of the inlet valves and hydraulic equipment or modification of the inlet/outlet facility itself. When dewatering is required, reservoirs may only require partial dewatering. However, this Plan assumes that all dewatering events include complete dewatering of the reservoir. Dewatering events may require up to 2.5 years.

Routine and preventative maintenance may be intensive and continuous. It is assumed that the maintenance footprint will be altered to a degree that there is no suitable habitat for any of the covered species. Over 85% of dam maintenance will permanently affect:

- The existing dam embankments, both upstream and downstream;
- Abutment areas within 100 feet of the dam face;
- Areas where there are seepage monitoring and control systems, seismic instrumentation and other monitoring equipment, valves and hydraulic lines (sometimes underwater);
- SCVWD-maintained access roads;
- The spillway area; and
- Adjacent areas within 100 feet of the spillway.

Activities may occur along roads leading to or around the dam area and in the reservoir pool area, including the delta at the upstream end of the reservoir. SCVWD may use herbicides and pesticides in accordance with BMPs described in Chapter 6, but shall be responsible for ensuring no take of covered species occurs as a result of herbicide and pesticide uses. Access roads may be paved with concrete or asphalt to manage erosion.

Although maintenance methods may vary seasonally and from facility to facility, the effects of dam and reservoir maintenance are consistent in terms of their purpose and general practices as described below.

### **Vegetation Removal**

DSOD requires that the dam face must be clearly visible so that any erosion, seepage, slumping, drainage, or burrows can be identified and corrected. All shrubs, trees, forbs, and debris will be removed using various techniques including mechanical removal, grazing, and/or controlled burns. Grasses will be maintained at low height. To prevent deep-rooted plants and burrowing animals from compromising dam embankment integrity, trees and deep rooted shrubs will be removed.

### **Seepage Collection System**

Seepage is water that slowly flows through a dam and to the surface usually near the downstream base. This is a common occurrence for earth fill dams, but needs accurate and regular monitoring. A change in the amount of seepage can indicate a change deep within the core of the dam, which may need to be addressed to ensure safety. A seepage collection system is installed to monitor seepage through a dam.

The seepage collection system is a component of the Dam Instrumentation Project described above under *In-Stream Capital Projects*, but it is maintained as part of the Dam Maintenance Program. The seepage collection system consists of several components at the base of a dam which collect seepage and allow accurate measurement of seepage flows through the dam. The components typically include below-grade seepage collection pipes, weirs, weir boxes,

V-ditches, track racks, and an upper graded area to direct the flows to the ditches. Sedimentation occurring over time may compromise the collection function and vegetation growth may prevent visual inspection; thus access for maintenance of the seepage system must be maintained.

Seepage collection system maintenance includes cleaning debris (rocks, vegetation, weeds, etc.) from weirs, erosion repair, grading, repairing concrete, and replacing components. Repairing portions of seepage pipes would include excavation with a backhoe to inspect the pipes, removal of the old pipe, and placement of the new pipe. Grading could be required as well. Seepage control and monitoring would also include installation of new weirs.

### **Burrowing Rodent Control**

Burrowing animals will be managed to prevent the construction of burrows. Management may involve efforts to reduce the populations of burrowing animals such as ground squirrels through use of pesticides<sup>18</sup>, kill traps, shooting rodents with air guns, or non-lead bullets and silencers and/or excavation and re-compaction of burrows that are found on the dam face and abutments. Once initial management is conducted, SCVWD will continue to manage burrows annually. Any burrows encountered subsequent to initial management will be excavated, re-filled, and compacted expeditiously to minimize the potential of creating a population sink for covered species.

### **Maintenance of Access to All Facilities**

Dam and reservoir access roads owned by SCVWD will be maintained including maintaining drainage under these roads. Within the maintenance footprint, road alignments may be changed and new roads constructed.

### **Sediment Management**

It is necessary to manage sedimentation of the reservoir, both to maintain reservoir function (for example, removal of sediment blocking inlets), and to provide a source of native gravels for downstream aquatic habitat enhancement. Accordingly, there will be on-going sediment extraction, sorting, cleaning, drying, stockpiling, and hauling at the upstream end of the reservoir involving the use of heavy construction equipment.

### **Other Management**

SCVWD may re-grade the dam embankment, repair and replace structures on and adjacent to the embankment (such as spillways, power lines, electrical facilities, repair erosion or embankment degradation, monitoring facilities, structures housing operations equipment, fencing, culverts, and other drainage facilities), and manage vegetation for fuels management and for exotic species management.

SCVWD may need to install or repair dam instrumentation other than the seepage collection system which is described above (the Dam Instrumentation Project is described above under *In-Stream Capital Projects*). This includes the repair of piezometers, inclinometers, survey monuments, real-time monitoring

<sup>18</sup> The use of pesticides or herbicides is not a covered activity for the USFWS permit.



systems, seepage collection systems, reservoir level gauges, and seismographs. Seismic investigations may include drilling or digging test pits or trenches. This work will be conducted concurrent with other maintenance activities described above

Major repairs to facilities may involve reservoir drawdown (dewatering) to allow access to facilities, excavation of exposed sediments, and removal of debris using a variety of heavy equipment. During such repairs, sediment may be removed from the reservoir. Based on historic frequency of major repairs, SCVWD projects that its eight reservoirs combined may require up to 18 dewatering events for 7 dams (all SCVWD reservoirs except Vasona which can be dewatered under routine operation practices) over the 50-year permit term. The 18 dewaterings are inclusive of both seismic retrofit activities and other maintenance. Dewatering events may be conducted for one hydraulic system replacement for the upstream valve for each dam (7); one seismic safety retrofit for four dams (4) (Calero, Guadalupe, Almaden, and Anderson); and one other dewatering event per dam (7).

All dewatering events would be planned in advance, require a dewatering plan as described in Chapter 6 that is approved by the Wildlife Agencies, and all releases will be consistent with **Table 2-4**.

## Non-Routine Stream Maintenance

The Stream Maintenance Program permits cover “routine” maintenance, as defined by those permits. The Stream Maintenance Program permits do not cover “non-routine” activities, so these activities are covered by this Plan. Non-routine stream maintenance activities performed by SCVWD for water supply and flood protection are listed below.

- One-time extensive (approximately 50%) vegetation removal, including removal of trees larger than 6 inches in diameter, in the Lower Llagas flood control channel to restore flood protection capacity. This activity is currently outside the scope of the Stream Maintenance Program; however, once this project is conducted and overall vegetation in the channel is reduced, this reach will be maintained under the Stream Maintenance Program.
- Repairs to canals including bank stabilization, sediment removal, and vegetation management not otherwise permitted by the Stream Maintenance Program (e.g., in serpentine vegetation areas and during the wet season). Wet season work would only be required in cases where the canal filled with sediment during winter storms and delaying removal of the sediment until the summer could result in canal failure or flooding of nearby homes.

## Three Creeks HCP Conservation Program Operations and Maintenance Actions

The following actions are proposed by SCVWD as part of the Three Creeks HCP and are covered activities of this Plan. SCVWD will not re-operate its facilities until it receives authorization from NMFS and CDFG. In the Three Creeks HCP study area this will be accomplished through the Three Creeks HCP. In addition to the activities described below, SCVWD will conduct general maintenance of facilities to support the Conservation Program similar to the maintenance actions described in this chapter.

### Reservoir and Recharge Re-Operation

The proposed Three Creeks HCP Conservation Program addresses modifications of reservoir and groundwater recharge operations to enhance flow, temperature, and water quality conditions in the channels downstream of reservoirs to promote better fish habitat. The following activities may be implemented as part of the Conservation Program.

#### Summer Cold Water Releases (May 1 to October 31)

Between May 1 and October 31, SCVWD will provide steady state releases of cold water from the reservoir hypolimnion of Anderson and Guadalupe reservoirs to the creeks downstream of each dam. The average area of this activity (designated as a Cold Water Management Zone or CWMZ) for each creek extends from the reservoir release point to a defined compliance point downstream. The length of the CWMZ will vary depending on the volume of hypolimnion storage and is adjusted once a month during the implementation period.

**Anderson Reservoir Releases to Coyote Creek.** Prior to restoration of Coyote Creek through the Ogier Ponds (a geomorphic rehabilitation activity described above in Section 2.3.3 *In-Stream Capital Projects*), the CWMZ will extend from the base of Anderson Dam to the southernmost pond of the Ogier Ponds Complex. Following restoration of the channel at Ogier Ponds, the compliance point will be the Old Riverside Golf Course (5.5 miles downstream of Anderson Dam). Following restoration of the channel through the Coyote percolation ponds, the CWMZ will be extended by another 3 miles to a maximum length of up to 8.5 miles.

**Guadalupe Reservoir releases to Guadalupe Creek.** The CWMZ at Guadalupe Creek will extend from the base of Guadalupe Dam to Camden Avenue (about 4 miles).

#### Winter Base Flow Releases (November 1 to April 30)

Between November 1 and April 30, SCVWD will provide winter base flows adequate to maintain an 8 inches water depth over at least 25% of critical riffle area for steelhead trout in the channel reaches downstream of the following dams and on-channel structures.

- Almaden Dam, between the dam and Alamitos Diversion (steelhead)
- Anderson Dam, between the dam and Ford Road crossing (steelhead)

- Calero Main Dam, between the dam and Alamitos Diversion (steelhead)
- Camden Avenue Drop Structure on Los Gatos Creek (which is located downstream of Vasona Reservoir)
- Guadalupe Dam, between the dam and Alamitos Diversion (steelhead)

#### **Pulse Flows (February 15 to April 30)**

Upon approval from NMFS and CDFG, SCVWD will provide releases from Almaden, Anderson, Calero, and Guadalupe reservoirs to provide for two 5-day pulse flows each year when reservoir storage is available to do so. In addition, at Anderson Dam, SCVWD will provide releases up to the capacity of the outlet (approximately 550 cfs) to enhance downstream channel and floodplain habitat.

In addition, in upper Penitencia Creek, SCVWD expects to experiment with flow regimes with the intent of increasing the number of out-migrating smolts on Upper Penitencia Creek. This includes working with the City of San José to optimize operations of Cherry Flat reservoir and adjusting the recharge operation with releases from the Bob Gross Recharge ponds. SCVWD will implement a ramping schedule so that releases do not wash native fish or covered amphibians, such as foothill yellow-legged frog, egg sacs and larvae, if present, downstream.

#### **Upper Penitencia Creek Management Program**

The proposed re-operation of SCVWD facilities in Upper Penitencia Creek is intended to substantially isolate the creek from the influence of water supply operations so that these operations have minimal effect on salmonid spawning, rearing, and outmigration. Upper Penitencia Creek re-operation will enhance upstream passage for steelhead and other native aquatic species and reduce the potential for supplemental flows from the South Bay Aqueduct to affect steelhead spawning, rearing, and outmigration.

The program may include the following.

- Removal of the existing Noble Diversions within 5 years of Three Creeks HCP permit issuance.
- Relocation of the Dorel Drive streamflow gauge 200 feet downstream.
- Rededication of SCVWD's existing water right to change the beneficial use to protection of fisheries.
- Isolation of the creek from off-channel recharge operations using screens.
- Management of imported water releases to ensure flow augmentation does not result in the creation of measurable flow at Stream Gauge 87 (the existing Mabury gauge).

#### **Supplemental Flow Program**

To implement the proposed Three Creeks HCP, SCVWD may need to provide supplemental flows to the base of Anderson and Calero Main dams and bypass flows at Almaden and Guadalupe dams to ensure that the conservation strategy flow targets for summer flows can be reliably met under a variety of conditions, such as implementation of DSOD Interim Storage Restrictions, short-term

equipment failures, and scheduled and unscheduled maintenance that requires reservoir dewatering.

Supplemental flows will be supplied by bypassing water around the reservoir using existing or temporary pipeline systems. If other sources of water, such as imported water or recycled water meet water quality criteria, they may also be used. Alternative water sources may be supplied through existing pipelines or through new temporary pipelines. This will require the construction of some new infrastructure to either bypass the flows from above the reservoir or to connect to alternative water supplies. Wells and pumps will be constructed in currently disturbed operational areas and pipelines will be constructed in the public rights of way. Pipelines will be constructed in and along roads, and connected to the channel at the base of the dam via existing operations roads. The footprint of these systems in natural habitats will be not more than 500 feet each. Temporary construction impacts may occur along the channel-side of the roads where the pipelines will be placed.

Temporary pipelines will be installed prior to the completion of reservoir drawdown and when supplemental flows are required. Temporary pipelines will be removed when supplemental flows are no longer needed.

#### **Monitoring Program**

SCVWD will conduct monitoring of species covered by the Three Creeks HCP. The monitoring program will include the same types of activities described below in Section 2.3.8 *Conservation Strategy Implementation*, subheading *Species Surveys, Monitoring, and Research*.

## **2.3.5 Rural Capital Projects**

This category addresses public infrastructure projects outside the cities' planning limits of urban growth. The operation and maintenance of these projects, as well as existing facilities, are described in Section 2.3.6 *Rural Operations and Maintenance*. Activities that are stream oriented and take place mostly within stream channels, such as bridge construction, and that are implemented by the Local Partners are discussed separately in Sections 2.3.3 *In-Stream Capital Projects*, and 2.3.4, *In-Stream Operations and Maintenance*. Rural residential development projects are discussed separately in Section 2.3.7 *Rural Development*. Private rural development, including new bridges installed as part of a rural development project, are discussed in Section 2.3.7 *Rural Development*.

Rural capital projects and activities that are covered under this Plan are listed below.

- Rural transportation projects including bicycle and pedestrian improvements (see description in following section).
- Development of or upgrades to new County Parks' facilities (described below).

- Renovation, replacement, and upgrades of existing facilities.
- Closures of trails, roads, and other infrastructure (such as stock ponds) in public open space (excluding the Reserve System).
- Facility development, renovation, and expansion including offices, office drainage improvements, and visitor centers.
- Water supply projects (see description below).
- Stormwater management facilities including a detention basin proposed by Morgan Hill outside of its planning limits of urban growth.
- Capital improvement projects by County Parks and the Open Space Authority<sup>19</sup> (see description below).
- Kirby Canyon landfill development (see description below).
- Implementation of the South County Airport Master Plan (see description below).

## Rural Transportation Projects

Transportation projects taking place outside of the planning limits of urban growth are included as covered activities in this Plan. Transportation projects within the planning limits of urban growth are considered part of urban development and are discussed in Section 2.3.2 *Urban Development*.

Transportation projects inside the planning limits of urban growth and in in-stream areas (i.e., bridges) are discussed in Section 2.3.3 *In-Stream Capital Projects*. Rural transportation projects provide and enhance infrastructure that supports existing development and new development planned under current general plans. Rural transportation projects and activities covered under this Plan include the following types of projects.

- County and VTA projects outside of the planning limits of urban growth and listed in **Table 2-6**. These include highway expansion, highway intersection upgrades, mass transit projects, and new road connection, extension, widening, and major realignment projects. Projects may include trails for pedestrian and bicycle use.
- County roadway safety and operational improvement projects to roads including shoulder widening and minor straightening of curves, and to intersections and driveway entrances including constructing new turning lanes, adding signals, and lengthening existing turning lanes. Projects may improve access for pedestrian and bicycle use.
- Channel modifications incidental to stream bank stabilization and road restoration.

A road realignment occurs when the position of an existing road is moved to create a more direct travel line (e.g., to eliminate a zigzag or straighten a curve).

<sup>19</sup> The Open Space Authority is participating in the Plan as a Participating Special Entity (see Section 8.4 *Participating Special Entities* for details).

A new connection or extension is when two different roads are connected together where a direct connection did not previously exist. New connections and extensions require up to 92 feet of road width along the length of the project and generally result in the full relocation of a section of roadway (i.e., the road is moved from one place to another). This differs from minor curve straightening conducted as part of safety/operational improvements where the roadway is slightly shifted (up to 8 feet) one way. Minor curve straightening may or may not be conducted in conjunction with shoulder widening.

Incidental take coverage will be limited to the types of projects described in the bullets above and to the specific projects described in **Table 2-6**. Projects described in **Table 2-6** include major County road projects and VTA highway and mass transit projects as described in the VTP 2035. These projects are shown in **Figure 2-7**. Transportation projects led by County Roads or by VTA occurring within the planning limits of urban growth are also shown on **Figure 2-7**, but are covered under Urban Development.

All of the VTA capital projects are proposed along existing transportation corridors and are located on the valley floor. One exception to this is that the U.S. 101 Improvement Project from Monterey Road to SR 129 includes a new extension of Santa Teresa Boulevard from Castro Valley Road to U.S. 101 (0.7 miles). This new alignment also requires a stream crossing. This project extends into San Benito County; only the portion of this project contained within the Permit Area is covered by the Plan.

County Roads has identified three new road extensions or connections in the permit area and outside of the planning limits of urban growth. These projects include:

- a connection of DeWitt Avenue to the West Edmundson Avenue / Sunnyside Avenue intersection near Morgan Hill (0.4 miles);
- a connection on Center Avenue between Omar Avenue and Buena Vista Avenue near Gilroy, requires a new stream crossing (0.2 miles); and
- a connection between Center Avenue and Hill Road across Maple Avenue immediately south of Morgan Hill (0.2 miles).

These projects will be conducted in conjunction with other road improvements. All other projects will occur along existing roads.

Two additional County road extension projects fall within or on the border of the planning limits of urban growth. These include the following projects:

- an extension of McKean Road to Almaden Expressway near the South Almaden Urban Reserve (0.2 miles) inside the planning limit of urban growth for San José; and
- an extension on Hill Road from Half Road to East Main Avenue (0.4 miles) and new connection of Peet Road to Half Road (0.2 miles) inside the planning limit of urban growth for Morgan Hill.

In addition to the projects listed in **Table 2-6**, County Roads anticipates constructing 33 miles of safety and/or operational projects that require widening of the shoulder or minor straightening of curves. These projects would require an additional 8 feet of road width over the length of the project. Up to 25 of the 33 miles may be located in the east or west hills outside of the valley floor area. County Roads also anticipates making 1.5 miles of improvements to roadway intersections and driveway entrances that include constructing new turning lanes, adding signals, and lengthening of existing turning lanes. Intersection improvements require up to 12 feet of additional road width. Up to 0.5 of the 1.5 miles may be located in the east or west hills outside of the valley floor area.

New roads constructed in association with rural development will be installed by the developer and not the County. New roads associated with rural development are described in Section 2.3.7 *Rural Development*.

## South County Airport Expansion

The South County Airport is located within the unincorporated community of San Martin in Santa Clara County. The airport is bounded by U.S. 101 to the east, San Martin Avenue to the north, and Murphy Avenue to the west. A mixture of residential, commercial, and industrial uses surrounds the airport on all sides.

South County Airport is owned and operated by the County of Santa Clara. The airport encompasses 179 acres and consists of a single runway and two parallel taxiways on either side of the runway. A large building area, containing nearly all of the airport buildings, is located west of Runway 14-32.

A new Master Plan for the South County Airport was developed in 2006 (County of Santa Clara 2006c). This plan outlines the expansion and redevelopment of the airport. Actions proposed in the master plan include those listed below.

- Extending the runway.
- Realigning the runway and taxi lanes.
- Constructing a new air traffic control tower.
- Expanding the capacity for hangars, tiedowns, and fixed base operators.
- Expanding fuel storage and dispensing areas.
- Adding wash racks.
- Remodeling airport facilities and terminal buildings including parking areas and access roads.
- Expanding existing stormwater detention basins.
- Replacement of the existing septic system with a package wastewater treatment plant.
- Relocating the existing animal shelter.

- Upgrading lights and signage.

No new land will need to be purchased for the County to develop the master plan elements described above. New lands may be purchased for the purpose of protecting the safety zones around the airport, but newly purchased property would not be used for airport development (Honaker pers. comm.). Projects and activities listed above that are related to the full implementation of the South County Airport Master Plan are covered by this Plan. Environmental compliance (CEQA and NEPA) is expected to be completed in mid- to late 2010.

## Kirby Canyon Landfill Development

The Kirby Canyon Landfill, operated by Waste Management of California, Inc., is located on land leased from Castle & Cook, Inc., at the southern end of Coyote Ridge near Anderson Reservoir. The need for a landfill in this area was first identified in the mid-1970s to support the urban, suburban, and rural growth of Santa Clara County. Currently, the landfill is subdivided into five fill areas and is proposed to affect 311 acres over its entire life. To date the landfill has been partially developed in Fill Area 1. Each Fill Area is composed of “cells.” Fill Areas 2 and 5 are next in the planned sequence of development following the remaining cell development in Fill Area 1. The current lease with the landowner expires in 2034.

An EIR was certified in 1983 by the City of San José for impacts on 484 acres (inclusive of a 326-acre landfill) on an 827-acre site (City of San José 1983). The landfill opened in 1986. The EIR described several sensitive biological resources at the site and required mitigation measures to mitigate the impacts to these species. Although landfill development occurs in phases incrementally over several decades, the mitigation addresses impacts on these resources that are caused by the entire landfill operation. The City of San José has issued a permit for the entire 311-acre landfill (City of San José 1984). Each of the five fill areas at the landfill is subject to subsequent City of San José Planned Development permit reissuance. These subsequent Planned Development approvals allow the City discretionary review of landfill operations, environmental conditions, and mitigation measures over the life of the landfill.

The EIR identified and addressed the following species or habitats of concern on the site: Bay checkerspot butterfly, California red-legged frog, prairie falcon, serpentine grassland plant community, and Mount Hamilton thistle. The biological conditions of approval in the City’s Planned Development permit for the landfill require a program to protect Bay checkerspot butterfly, a program to replace Mt. Hamilton thistle, and a program to preserve California red-legged frog.

In response to the EIR and the project Planned Development permit conditions, a conservation plan was developed by Waste Management in 1985, prior to the listing of Bay checkerspot butterfly, to mitigate the effects of landfill development, operations, maintenance, and closure activities associated with the property. The butterfly was not listed at the time, but it was proposed for listing.



The Federal Highways Administration obtained a conference opinion from USFWS regarding landfill impacts on Bay checkerspot butterfly because the Federal Highways Administration was preparing an environmental assessment on the construction of the Scheller Avenue interchange to serve the landfill. After Bay checkerspot butterfly was listed, the conference opinion was revised into a biological opinion in 1993.

The conservation plan for Bay checkerspot butterfly in the 1993 biological opinion specifies the provisions listed below.

- Management and monitoring of 250 acres of prime Bay checkerspot butterfly serpentine grassland habitat through a lease and control of grazing practices for 13 years<sup>20</sup>.
- A study of revegetation methods for restoring Bay checkerspot butterfly grassland habitat to finished landfill slopes.
- Monitoring of the Bay checkerspot butterfly population.
- Study of possible relocation sites if the onsite mitigation is unsuccessful or the landfill impacts are greater than expected.

Implementation of the conservation plan is overseen by a Board of Trustees that includes a representative from the City of San José, one from Waste Management, and an independent scientist. Annual reports are provided to the Trust regarding the status of implementation of the conservation plan activities. To date, the 250-acre lease area is still managed with grazing; a revegetation plan has been prepared; the butterfly population is monitored annually; and, although offsite areas to relocate Bay checkerspot butterfly were identified, this option was found both infeasible once the butterfly was listed and unnecessary because the landfill had little effect on the stability of the butterfly population.

Subsequent to the conservation plan for Bay checkerspot butterfly, Waste Management obtained permits for filling of wetlands at the site. While Waste Management initially obtained Nationwide Permit 26 authorization for filling 3.62 acres of jurisdictional wetlands and waters of the United States associated with the entire landfill project, for business reasons the company revised its proposal and obtained a permit from the Corps (USFWS Biological Opinion 1-1-97-F-5) for filling up to 1.76 acres, including the landfill and the mitigation area. As a result of that permit process, a Mount Hamilton thistle wetland and breeding habitat for California red-legged frog were successfully established and monitored for 5 years. The California red-legged frog population at the site has been greatly increased, and annual monitoring of California red-legged frog at the site is ongoing.

Waste Management obtained additional permits from the Corps, Regional Water Quality Control Board, and CDFG to complete filling in Fill Areas 1, 2, and 5. A biological assessment was developed (Thomas Reid Associates 2003) and the

<sup>20</sup> Although the biological opinion required management and monitoring for 13 years, Waste Management continues to support an agreement with a rancher to control grazing levels on the 250 acres and the site is monitored annually for the Kirby Canyon Landfill Conservation Trust (Waste Management 2008).

subsequent biological opinion issued for the Corps permit (1-1-03-F-0213; July 2003) addresses California red-legged frog, Santa Clara Valley dudleya, and Bay checkerspot butterfly critical habitat for the entire 827-acre project site. The 2003 biological opinion requires that, upon closure of the landfill, a permanent conservation easement be placed on 300–350 acres of restored landfill for the protection of California red-legged frog. An endowment will be established to provide adequate financing for the perpetual management and maintenance of the conservation easement. Other mitigation includes creating an additional wetland and offsite habitat restoration.

Permits and mitigation for wetland impacts in Fill Areas 3 and 4 of the planned 311-acre landfill have not been authorized.

In summary, USFWS has issued biological opinions providing take authorization for the entire approved landfill footprint for California red-legged frog, Bay checkerspot butterfly and its critical habitat, and Santa Clara Valley dudleya. Mitigation already in place for the entire envisioned and approved landfill footprint includes establishment of new breeding habitat for California red-legged frog, restored upland habitat for the frog, restored serpentine habitat for Bay checkerspot butterfly and rare plants, and funding to provide long-term monitoring and adaptive management of permanent habitat easements (U.S. Fish and Wildlife Service 2003).

USFWS found that the entire landfill development is not likely to jeopardize the continued existence of the listed species or to adversely modify or destroy Bay checkerspot butterfly critical habitat in Unit 8. While the entire landfill project has USFWS authorizations for the species listed above, and local zoning and use permits, future authorization for currently undisturbed portions of Fill Areas 3 and 4 will be required from the Corps and state agencies.

Future development of Fill Areas 3 and 4 at Kirby Landfill are covered activities in this Plan for the covered species not already addressed in the existing biological opinions for the site (i.e., all species covered by this Plan except Bay checkerspot butterfly, California red-legged frog, and Santa Clara Valley dudleya).

## **SCVWD Off-Channel Groundwater Recharge Ponds**

To enhance its water supply infrastructure and to meet future anticipated demand, SCVWD may construct additional groundwater recharge ponds (also called percolation ponds). SCVWD anticipates that up to four new, off-stream groundwater recharge ponds and associated conduits will be installed within the permit area over the course of the permit term. Three of these sites will be located along the valley floor within Morgan Hill and to the south in San Martin. While these sites are in close proximity to Llagas Creek, the ponds will be constructed off-channel. The fourth site will be located near the Cross-Valley Pipeline in the southern portion of the Coyote Greenbelt and will also be off-channel. The three sites in Morgan Hill and San Martin will each be approximately 10 acres in size. The site in the Coyote Greenbelt will be

approximately 15 acres in size. The exact location of the ponds will be identified through future siting studies. However, the approximate locations are shown on **Figure 2-6**. These new off-channel recharge ponds are separate from the reoperation of the Ford Road and Church Avenue recharge ponds described above in Sections 2.3.3 *In-Stream Capital Projects* and 2.3.4 *In-Stream Operations and Maintenance*.

These projects may require installation of piping or a conduit to transport local and imported water to the sites, but will not require any additional in-channel diversions. Sites in Morgan Hill are generally supplied, by pipeline, with Central Valley Project water from San Luis Reservoir. If the Santa Clara Conduit is shut down due to maintenance or inspections, water may be provided by Anderson and or Coyote Reservoirs. The site in San Martin will likely receive water from Chesbro and Uvas Reservoirs via the Uvas/Llagas Transfer Pipeline. The site in the Coyote Greenbelt will likely receive water via the Cross-Valley Pipeline. These projects may also require up to 1.5 miles of new access roads; however, existing access roads will be utilized whenever possible. Construction of these ponds is a covered activity under this Plan.

## County Parks Projects

As guided by the *Santa Clara County Parks and Recreation System: Strategic Plan* (County of Santa Clara, Parks and Recreation Department, August 2003), County Parks continues to develop integrated master plans and natural resources management plans that incorporate recreation, resource planning, historic planning, interpretive planning, operations and maintenance impacts and environmental documentation. To date, County Parks has developed several park and trail master plans and natural resource management plans that it currently implements and will continue to implement throughout the permit term. All of these plans will be updated during the permit term of this Plan to address the on-going and changing operational needs of its parks. In addition, County Parks is developing or plans to develop master plans and natural resource management plans for several additional parks.

To develop the following list of projects and activities, County Parks evaluated past, present, and anticipated activities and projects for which it will require coverage during the permit term. The projects and activities covered by this Plan include the following.

- Trail and fire road development, and installation of related infrastructure such as bridges, staging areas, restrooms, parking lots, and signage.
- Development of borrow sites for materials used for trail structures (e.g., rock) or restoration projects (e.g., clay for wetland substrate). Whenever possible, borrow sites will be used to create habitat for covered species (e.g., a pond for California tiger salamander). Location of borrow sites will be within County parks, but exact locations are unknown at this time. County Parks will avoid sensitive land cover types. Over the permit term, County Parks estimates that borrow sites will require up to 3 acres. Borrow sites will be primarily sited in grassland areas that support conversion to wetland or

pond habitat once borrow materials are excavated. If County Parks creates ponds for the improvement of covered species, soil removed may be stockpiled and stored for future use to reduce the need for additional borrow pits at future times.

- Development of regional recreation opportunities and supporting infrastructure including group and family picnic areas, drive-in campgrounds, back-country camp areas, a regional swimming facility, nature/education centers, historic and cultural resources, disc golf courses, an 18-hole golf course and club house, sport fields, off-leash dog parks, dog runs, road and mountain bicycle park, fishing ponds, events pavilions, shade structures, hang gliding/paragliding landing sites, urban edge farming, historic agricultural park, agricultural marketing area (i.e., expanded produce stand, farmers market area, retail café, and parking), community gardens, research and demonstration gardens, youth agricultural areas, staging areas including restrooms, equestrian staging areas including water troughs, parking, operations and maintenance facilities and buildings, park ranger facilities, multiple use areas, public art installations, gateway sites (e.g., trailheads, park entrances, kiosks), paved and dirt roads, seating (e.g., benches), landscaping, fencing, irrigation, water tanks, interpretive signage, sewer, water, and other utilities.
- Capital improvements to existing trail systems including reconstruction, realignment and, in areas where the use is compatible, the addition of separate single-use trails (e.g., equestrian trails). These improvements also include trail restoration in areas where abandoned trails are no longer in use.
- Capital improvement expansion or rehabilitation of existing facilities including campgrounds, equestrian camping sites, day-use picnic sites, staging areas, parking, restrooms, entry and gateway sites (e.g., trailheads, park entrances, kiosks), buildings, landscaping, irrigation, fencing, interpretive signage, sewer, water, and other utilities.
- Restoration, creation, enhancement, and/or rehabilitation of habitat including riparian, wetlands, ponds, grassland, and oak woodland natural communities outside of the Reserve System (restoration and enhancement within the Reserve System on County Park lands is described in Section 2.3.8 *Conservation Strategy Implementation* below).
- Installation of fish screens at Parkway Lakes, Cottonwood Lake, and Spring Valley to prevent movement of fish in and out of these lakes and to support recreational fishing opportunities.
- Construction of stock ponds or spring boxes<sup>21</sup> for cattle management and installation of wells to supply stock ponds outside of the Reserve System (restoration and enhancement within the Reserve System on County Park lands is described in Section 2.3.8 *Conservation Strategy Implementation* below). Spring boxes will be preferred over wells. Up to 40 wells or spring boxes may be constructed for use in County parks. Wells and spring boxes will be sited so that they do not degrade surrounding habitat.

<sup>21</sup> Spring boxes are boxes or culverts installed into the ground to provide water through a series of pipes to a tank or directly to a trough for recreation or cattle management.

- Reconstruction of pond dams or spring boxes to maintain water levels and facility functioning.
- Replacement of the water delivery system at Jackson Ranch. This includes excavation and replacement of the existing system.

Intensive recreational uses or facilities (e.g., golf courses, regional sports complexes, sports fields, pavilions, nature centers, off-leash dog parks) generally are planned to occur in the valley floor area closer to urban and rural centers. Facilities planned in the near and far hills will focus on less intensive recreational uses such as trails and back-country camping sites.

County Parks estimates it will construct outside of the planning limits of urban growth no more than 20 miles of fire road; 25 miles of unpaved, single-track trail; 3 miles of paved service roads; 7 miles of paved multi-use trail; and 10 miles of paved roads. This does not include roads and trails that are part of a larger site development (e.g., nature center, large picnic areas, pavilions, golf course, etc.). County Parks estimates it will construct outside of the planning limits of urban growth up to 300 non-bridge water crossings (e.g., single-track trail crossings), 20 large bridges (i.e., one-or two-way automotive use), and 30 small bridges and puncheons (i.e., footbridges). County Parks estimates it will conduct larger-scale site development projects (e.g., nature center, large picnic areas, pavilions, golf course, etc.) outside of the planning limits of urban growth requiring approximately 1,700 acres.

## City of San José Projects

Alum Rock Park Riparian Management Plan provides a management strategy to protect and restore the riparian and aquatic resources along Upper Penitencia Creek within this 740-acre Park (Biotic Resources Group 2001). The Riparian Management Plan provides a comprehensive set of goals, policies, and management actions that integrate watershed resources and reflect the unique quality of the park's riparian and aquatic resources. This management document is focused on enhancing and restoring Upper Penitencia Creek with Alum Rock Park.

Activities that will be conducted under this plan include the following.

- **Hillside instability and landslide prevention.** Measures to reduce the potential for mass wasting this include the repair of eroded area and revegetation of exposed areas. Activities may also include improvements to hillside drainage by installing additional culverts along localized roads and trails.
- **Streambank erosion.** Consider setting back the existing bank and recontouring the slope to reduce existing erosion issues. Projects may include enhancing the channel bed to provide pooling areas and vegetative cover along the channel.

- **Riparian and aquatic habitat restoration and enhancement.** Revegetate the sediment bar and other degraded areas adjacent to the stream channel to restore a riparian corridor. Create new and expand the existing floodplain and side channel habitat.
- **Facility upgrades.** Relocate existing picnic area approximately 20 feet outside of the riparian corridor.

## Open Space Authority Projects

As described above, the Open Space Authority owns and manages several properties in the study area. Although not a Permittee, the Open Space Authority has requested that their activities within the permit area be covered by the Plan if they choose to seek this coverage as a Participating Special Entity (see Chapter 8, Section 8.4 *Participating Special Entities* for this method of coverage).

The Open Space Authority will be developing use and management plans for each property to address protection of natural and cultural resources; opportunities for appropriate visitor access and passive recreation; environmental education and outreach; site safety; and maintenance and operations. These plans will be updated over the course of the permit term, and new use and management plans will be prepared for additional properties that are protected by the Open Space Authority.

Open Space Authority staff evaluated typical open space preserve management projects and activities that occur on existing land holdings, as well as those that are anticipated to occur on future land holdings, in order to identify projects and activities that will require coverage by this Plan. These include:

- Construction and maintenance of visitor amenities including parking areas, roadside pullouts, trailheads, and associated restrooms, picnic areas, shade structures, interpretive facilities, signage, landscaping, and utilities. Construction or repair of existing structures for use as nature centers, hostels, education facilities, or staff support facilities.
- Construction and maintenance of new multiple-use trails with associated bridges, culverts, fords, or other water crossings, and armored surfacing where necessary to accommodate those with disabilities. Installation of signage, benches, and facilities such as back-country campsites and interpretive displays.
- Construction and maintenance of necessary agricultural infrastructure including farm stands, community gardens, research and demonstration gardens, fencing, gates, stock ponds, developed springs, water tanks, and irrigation and drainage infrastructure.
- Maintenance of existing roads including repair, replacement, and installation of bridges, culverts, and other road drainage structures. Decommissioning and restoration of former logging or ranch roads that are no longer necessary for safety patrol, fuels management, or recreational purposes. Realignment

or construction of new roads when necessary to replace poorly located roads that are impacting the environment.

- Development of facilities for management and administration of open space resources including field offices, corporation yards, on-site employee housing, and storage facilities.
- Implementation of resource management and monitoring programs such as restoration, creation, and/or enhancement of habitat including riparian, wetlands, ponds, grassland, mixed evergreen, and oak woodland natural communities. Typical resource management programs include grassland management utilizing cattle grazing and prescribed fires; eradication of invasive plant and animal species, herbicide use, and integrated pest management projects; wildland and urban-interface fuels management including prescribed fires, grazing, and shaded fuel breaks; in-stream and riparian habitat restoration; signage and fencing to protect and/or interpret cultural sites; and implementation of road and trail best management practices to reduce erosion and sediment delivery to watercourses.

## 2.3.6 Rural Operations and Maintenance

This category addresses the rural operations and maintenance activities to be covered under this Plan. Operations and maintenance activities within streams are described separately in Section 2.3.4 *In-Stream Operations and Maintenance*. Rural operations and maintenance activities outside of streams that may receive coverage under this Plan include the following.

- Utility line or facility operations and maintenance as described below.
- Facility maintenance including vegetation and infrastructure management.
- Pond maintenance outside the Reserve System.

### Utility Maintenance

Public and private utility infrastructure such as electric transmission lines, gas pipelines, petroleum pipelines, telecommunications lines, and cellular telephone stations cross the study area. Public and private utilities that are Participating Special Entities (see Section 8.4 *Participating Species Entities*) may request coverage under the Plan for routine maintenance and repair of existing utilities within the permit area. Maintenance activities will generally require trenching around existing pipelines and conducting repairs or replacing segments of pipeline. Coverage for these projects will be decided on a case-by-case basis by the Implementing Entity and Wildlife Agencies. This will allow alternative maintenance approaches, if possible, to avoid or minimize impacts on covered species and natural communities.

## Facility Maintenance

Facility maintenance refers to maintenance of existing facilities such as buildings, roads, trails, parking lots, and airport property. A large component of this maintenance is vegetation management. Vegetation management includes fuel reduction using prescribed burns, grazing activities, exotic vegetation control/removal, hazardous tree work, abatement of hazardous vegetation, and algae control in ponds. Vegetation management also includes turf management, paving, and landscaping around infrastructure and facilities.

Facility maintenance also includes the maintenance of infrastructure such as buildings, roads, utilities (septic, water, power systems), and stormwater treatment. Rodent, pest, and invasive plant species abatement activities may also be conducted for facilities maintenance.

## Pond Maintenance

Pond maintenance on private lands outside the Reserve System is a covered activity if the project proponent receives a ministerial or discretionary permit for this activity from the County or one of the participating cities and complies with the management actions below in addition to the conditions and application processes described in this Plan (see Chapter 6). This covered activity is designed to provide an alternative permitting mechanism for maintenance of stock ponds, but it may support other pond maintenance needs as well. Removal of existing stock ponds is not covered under pond maintenance.

The following management actions are consistent with the conservation strategy management actions for ponds described in Section 5.3.7 *Wetland and Pond Conservation and Management*.

### Required Management Actions

- All vegetation removal will occur after the breeding season for pond-dependent wildlife, including nesting migratory birds.
- If vegetation targeted for removal includes nonnative vegetation on which covered species rely for habitat (e.g., tricolored blackbirds nesting in Himalayan blackberry), the removal will be undertaken in phases over a 3- to 4-year period and replaced with similar, native vegetation suitable to the site.
- If the pond is located in modeled California red-legged frog habitat, vegetation management activities may only occur between August 30th and October 15th.
- If the pond is leaking, repairs will be made to improve water retention and duration.
- All invasive or predatory non-native species (e.g., bullfrogs, mosquitofish, and nonnative predatory fish) will be removed and disposed of by a qualified



biologist. Management techniques described in **Appendix K** *California Tiger Salamander Hybridization*, will be implemented, as deemed appropriate by the project proponent in coordination with the Implementing Entity.

- If the pond is creating or contributing to local erosion, fixes will be made to eliminate the ponds contribution to such issues.
- If needed, dredging will be conducted during the non-breeding periods of covered and other native species (e.g., tricolored blackbird, California tiger salamander, California red-legged frog, or western pond turtle).
- Any disturbed areas will be re-seeded with native vegetation appropriate for the surrounding natural communities for replacement of lost ecological services and function.
- Any herbicide application conducted in ponds or wetlands must use products that have been approved for aquatic communities.
- Grazing rotation and targeted fencing will be used to maintain appropriate vegetation in and around the pond and to reduce existing or potential erosion issues.

### Recommended Management Actions

- If a pond dam requires reconstruction, consider increasing the spillway elevation to increase pond capacity and improve water duration if appropriate<sup>22</sup>.
- If the pond lacks vegetation, consider native plantings where appropriate, after consultation with the Implementing Entity.
- Coarse woody debris or anchored basking platforms may be installed in ponds to improve habitat for western pond turtles (Hays et al. 1999).

Activities conducted by individual Local Partners are identified below.

## Santa Clara Valley Water District

SCVWD operations and maintenance activities outside of streams (i.e., in upland areas) that will receive coverage under this Plan include the following.

- Operations and maintenance of pump stations, operations yards, utility yards, and corporation yards including storing sediment, and truck access.
- Off-stream groundwater recharge sites and associated facilities. Activities may include removal of sediment and vegetation and maintenance of associated roads, diversion structures, and catwalks. See Section 2.3.4 *In-*

<sup>22</sup> In some cases, increasing the spillway elevation may not be appropriate because increasing the inundation period may facilitate the persistence or introduction of non-native species that have detrimental effects on covered species.

*Stream Operations and Maintenance* subheading *Recharge Operations and Maintenance* for additional detail.

- Maintenance of water supply facilities including buildings, rain gauges, pipelines, and turnouts (Pipeline Maintenance Program is described below).

## Rain Gauge Maintenance

SCVWD maintains 39 rain gauges throughout the County. These gauges have a footprint of 9 inches in diameter and are generally located in the upper watershed. Maintenance includes spraying herbicide around the base of the gauge, trimming and/or removal of small to large trees affecting the “catch” of rainfall (i.e., the ability to capture rainfall unobstructed), and trimming of vegetation along access roads to reduce fire hazards. Maintenance may also include modification and/or reconstruction of existing rain gauges. During maintenance a radius of approximately 3 feet is cleared all around the gauge. Rain gauges are accessed from the nearest road. Maintenance of rain gauges is a covered activity under this Plan.

## Pipeline Maintenance Program

SCVWD developed the Pipeline Maintenance Program document (Santa Clara Valley Water District 2007a) and issued the Pipeline Maintenance Program Final EIR (Santa Clara Valley Water District 2007b) in September 2007. SCVWD owns and/or maintains several pipelines and pipeline facilities throughout the study area. These pipelines are located in both unincorporated and incorporated areas of the permit area. However, because the majority of impacts associated with implementation of the Pipeline Maintenance Program will occur in rural areas, the program is discussed in this section.

To address maintenance for these pipelines, SCVWD developed the Pipeline Maintenance Program to establish a process for conducting routine water-conveyance-system maintenance activities within its jurisdiction. The work area subject to the Pipeline Maintenance Program includes the areas around water conveyance systems facilities, including pipelines, pump stations, blow-offs, turnouts, and vaults. The project area also includes the streams, fields, storm drains, and channels where discharge of water during pipeline draining can occur. Pipeline maintenance activities also occur off-stream within urban areas, however, those activities are expected to have much less impact on covered species within urban settings. Additionally, all types of urban operations and maintenance programs are addressed in the urban development category.

Facilities owned and/or operated include the following pipelines and components.

- Almaden Valley Pipeline.
- Anderson Force Main.

- Calero Pipeline.
- Campbell Distributary.
- Central Pipeline.
- Coyote Pumping Plant.
- Coyote-Madrone Pipeline.
- Cross Valley Pipeline.
- East Pipeline.
- Main Avenue Pipeline.
- Milpitas Pipeline.
- Mountain View Distributary.
- Pacheco Conduit and Pacheco Tunnel.
- Pacheco Pumping Plant.
- Parallel East Pipeline.
- Penitencia Force Main.
- Rinconada Force Main.
- Santa Clara Conduit and Tunnel.
- Santa Clara Distributary.
- Santa Teresa Force Main.
- Snell Pipeline.
- Stevens Creek Pipeline.
- Sunnyvale Distributary.
- West Pipeline.
- Uvas-Llagas Transfer Pipeline.

The Pipeline Maintenance Program defines a comprehensive approach to managing the environmental impact of maintenance. The Pipeline Maintenance Program specifies protocols for management and maintenance crews from different divisions working on the same activity to conduct the operations, including the environmental commitments, associated with that work.

In developing the Pipeline Maintenance Program, it was SCVWD's intent that the program and mitigation defined in the Pipeline Maintenance Program serve as the basis for state and federal permits and permit conditions; therefore, regulatory agencies were consulted early in the Pipeline Maintenance Program definition process.

The routine maintenance activities described in the Pipeline Maintenance Program address both raw and treated water pipelines. Over 125 miles of pipeline support delivery of local and imported water in the County. Activities

covered by this Plan include the following. If excavation is required for the activity, it is noted below.

- Cathodic protection and monitoring. Cathodic protection is typically applied to a pipeline by applying small electric current that overdrives or redirects the natural corrosion process, controlling the natural decomposition process of steel to iron-ore. This is accomplished through the use of inexpensive sacrificial metals such as magnesium or zinc electrically attached to a pipeline or by forcing an electric current with an external power supply. Cathodic protection systems are monitored frequently to adjust them to varying soil environments, water tank levels, coating deterioration, and external construction. Where sacrificial metals are employed, routine monitoring is necessary to determine the sacrificial metal's condition and future replacement.
- Leak repair. May require blow-off—dewatering of pipes that typically includes a point sources of high velocity flow—to local uplands or streams and/or excavation to access pipelines. The schedule for leak repairs is variable, guided by the results of monthly visual inspections made by helicopter. The Pipeline Maintenance Program requires a *Water Discharge Definition Plan* for this activity. A *Water Discharge Definition Plan* would describe the total volume discharge water and flow rate, nozzles, vaults, blowoffs, and dissipaters to be utilized.
- Internal inspection. May require blow-off to local uplands or streams. Internal inspections are planned at 5–10 year intervals for each pipeline. Certain facilities (Santa Clara Tunnel, Pacheco Tunnel, and Calaveras fault crossings) once every 5 years. This activity requires a *Water Discharge Definition Plan* (see above bullet for description).
- Unscheduled releases of water due to a pressure surge in a pipeline that could damage pipeline. Under such conditions, an automatic turnout valve will open and release the water to prevent the pipe from bursting. Flows from the pipeline may be reduced following such an event. This type of event is only expected to occur at two facilities located along Los Gatos Creek, the receiving body for these releases. This would occur infrequently, but there is no data system associated with these valves, thus SCVWD does not know exactly how often this occurs. The valves would open for less than one minute and would shut as soon as system pressure dropped.
- Rehabilitation and/or replacement of pipeline components including but not limited to air release valves, piping sections or connections, joints, and appurtenances. Activities may include excavation to access pipelines.
- Bank stabilization and erosion control within creek related to pipeline maintenance. Discharges either come out of pipes within a stream bank and flow down the bank into the channel, or are pumped down or across a stream bank. Bank protection work would occur prior to a planned discharge in areas where banks within 50 feet of the discharge point show signs of erosion or instability. May require excavation.

- Replacement/repair of buried service valves (including valves within creek embankments that may require excavation and minor bank stabilization activities).
- Maintenance of pipeline turnouts, including access to pipelines.
- Replacement/repair of appurtenances, fittings, manholes, and meters.
- Vault maintenance. Vaults occur along segments of pipeline. Pipeline components are located within vaults. There are different types of vaults and all are considered confined spaces. Structures other than the pipeline contained within vaults include valves, electrical stations, turnout piping, etc. Telemetry pull boxes, corrosion monitoring stations, and some air release valves are not located within vaults. Vaults are typically made of concrete and may be located immediately below grade (below ground level) or partially or fully above grade.
- Telemetry cable/system inspections and repairs. Telemetry systems allow communication of data from the pipeline to SCVWD so that they can track the operations of the pipeline. Telemetry cables are generally sited in the center of roads. May require excavation to access system components.
- Meter Inspections and repairs. Flow meters measure the rate of flow through a pipeline. Some meters are located in vaults while others are not.
- Maintenance of pump stations, operation yards, utility yards, and corporation yards.
- Maintenance of pump stations, operation yards, utility yards, corporation yards, vaults and turnouts includes vegetation management. This task may be accomplished through chemical and/or mechanical means depending on the sensitivity of the regional habitat.
- Access road repairs. Excavations of various sizes are often needed to maintain the access roads. Excavation may be required to fill pot holes, conduct drainage and erosion control, conduct shoulder and slope repair, or regravels existing access roads. Access road excavations could be very small (e.g., to repair a pot hole or shoulder slump), or involve larger, linear excavations (e.g., to install or replace culverts or drainage ditches, repair slope failures for elevated access road fills).

This is the general list of activities that are necessary to maintain proper function of all pipelines within SCVWD system. Each of these activities includes additional subtasks, which are the individual steps involved in completing the overall activity.

As noted above, blow-offs are sometimes required to repair or inspect a pipeline. If available, SCVWD directs released water into available turnouts such as off-channel recharge ponds. If not available, water may also be directed to local waterways, storm drains, other urban drainage channels, open fields, or wetlands. Discharge into waterways is accomplished first by gravity flow and then by pumping out residual water. Flow rates can be controlled manually to be between 0–20 cfs for gravity flow blow-offs by manipulating valves. Maximum pump capacities range from 3.3 to 11 cfs. The discharge rate is ramped up

slowly such that the buildup of water in any streams, rivers, or canals is gradual and scouring of the channel bed and ground surfaces does not occur. Discharge to wetlands is generally avoided (it may require additional regulatory permits), although it is sometimes necessary. Discharge to dry soil is also avoided and is not common for large volumes of water (see Chapter 6, Condition 5 for additional stream avoidance measures for pipeline maintenance activities).

The Pipeline Maintenance Program Final EIR identifies direct permanent and temporary impacts from activities grouped into the categories of staging, off-road access, pipeline drainage, excavation, and repair. Impacts are assessed based on assumed for annual maintenance activities. Consistent with two key assumptions of the EIR, this Plan would cover the effects associated with the maintenance of up to 5 pipelines each year. It would also cover up to a total of 10 blow-offs (scheduled and unscheduled) each year. See Chapter 4 for additional detail related to the impacts of this activity. Pipeline Maintenance Program activities outlined above that fall within the permit area may receive coverage under this Plan.

## County of Santa Clara

Rural operations and maintenance activities conducted by the County of Santa Clara outside streams that may receive coverage under this Plan are listed below.

- Maintenance, repair, and rehabilitation of County roads and road shoulders, including pothole repairs, overlays, resurfacing of existing paved areas, construction of retaining walls to stabilize adjacent embankments, vegetation removal (e.g., overhanging bushes, trees), and re-grading to maintain a functional shoulder.
- Maintenance of infrastructure associated with roads including drainage ditches, culverts, and retaining walls.
- Operations, maintenance, and fire protection of rural juvenile detention facilities (e.g., James Ranch and Muriel Wright Center), medical treatment facilities (e.g., Mariposa Lodge), the Santa Clara County Justice Training Center (also known as Holden Ranch), and the Santa Clara County Weapons Training Center (also known as the Sheriff's Firing Range).
- Operation, maintenance, and management of County parks including trail and road maintenance, facility maintenance, vegetation management around structures.
- County Parks management of natural resources including grassland, oak woodland, and riparian natural communities; protection and enhancement of freshwater resources; erosion control; sensitive species management and monitoring outside of the Reserve System (restoration and enhancement within the Reserve System is described in Section 2.3.8 *Conservation Strategy Implementation* below). Management may include prescribed burns, mechanical fuel removal, invasive vegetation management, manual labor, herbicide use, bullfrog management, feral pig removal, management of other exotic nuisance species, and managed grazing.

- County Parks management and maintenance of ponds and spring boxes including temporary draining for amphibian management, dredging or clearing of debris and sediment for water management for cattle, and rehabilitation due to erosion and/or pond or box failure. This does not include pond removal.
- County Parks dam maintenance including burrow management, vegetation removal, dam repairs, and dam facility repairs (short of dam reconstruction which is described above in Section 2.3.3 *In-Stream Capital Projects*).
- Removal of infrastructure (e.g., building structures, roads, trails, stock ponds) for public safety, resource protection, and park management. County Parks may remove up to four stock ponds that do not provide habitat for covered species. Ponds that do provide habitat for covered species may be considered on a case by case basis by CDFG and USFWS.
- Use of County parks consistent with park management plans. Uses vary by park but may include walking, hiking, horseback riding, biking (road and mountain), fishing, swimming in designated swim facilities, recreational sports, nature watching, horse-drawn carts, drive-in camping, equestrian camping, back-country camping, on- and off-leash dog areas. Coverage is only provided to County Parks for the indirect effects of allowable recreational uses.
- Vegetation management for exotic species removal and native vegetation plantings including the use of livestock grazing and prescribed burns.
- Trail maintenance including grading, clearing, brushing, erosion control, paving, re-paving, abandonment, and restoration.
- Pest abatement to manage rodents, insects, and disease, and weed abatement to manage fire hazards outside the Reserve System including removal of dead and dying wood, trees, and vegetation in agricultural areas. May include mowing or disking for weed abatement and spraying for insect and disease management. Use of rodenticide is not covered by this Plan for the USFWS permit.
- Surveys and monitoring to support management decisions outside of the Reserve System (monitoring within the Reserve System is described in Section 2.3.8 *Conservation Strategy Implementation* below).
- Enhancement and restoration projects outside of the Reserve System.
- Removal of fish barriers (such as low flow crossings) and installation of fish screens.
- Maintenance of water delivery systems (e.g., at Jackson Ranch). This includes maintenance of in-stream structures that have a screened pipe that pulls water from a local stream into the property.
- Activities associated with the maintenance of large facilities including golf courses, large event facilities, and sports complexes.
- Equestrian facilities and uses including equestrian stables, equestrian centers, trails, manure management, equestrian group camping and horse grazing activities.

- Minor remediation projects (less than 1.0 acre) for spills, illegal dumping, fuel/chemical storage, and firing ranges.

## Open Space Authority

Operations and maintenance activities conducted by the Open Space Authority in all of their preserves (both existing preserves and preserves acquired during the permit term that are located within the permit area) are covered by this Plan if they choose to seek this coverage as a Participating Special Entity (see Chapter 8, Section 8.4 *Participating Special Entities* for this method of coverage).

Maintenance activities may include the following.

- Vegetation management, including fuel reduction using prescribed burns, grazing activities, exotic vegetation control/removal, hazardous tree work, abatement of hazardous vegetation, and algae control in ponds.
- Invasive wildlife species management, including feral pig and bullfrog management.
- Restoration, rehabilitation, and enhancement, not including removal, of existing stock ponds that have degraded due to severe erosion or dam failure.
- Creation of new ponds to support livestock grazing or wildlife.
- Spring development, including installation of a spring box, and repair of existing spring boxes.
- Road and/or trail closure or realignment due to erosion problems or close proximity to sensitive land cover types.
- Use of Open Space Authority lands outside of the Reserve System consistent with their management plans (activities within the Reserve System are described below). Uses vary by park but may include walking, hiking, biking (road and mountain), horseback riding, and nature watching. Coverage is only provided to the Open Space Authority for the indirect effects of allowable recreational uses.
- Activities associated with the maintenance of facilities including small structures, paving, and landscaping.
- Maintenance of infrastructure facilities including buildings; roads (paved and unpaved); and utilities (septic, water, power systems).

### 2.3.7 Rural Development

Rural development includes private development that will occur in accordance with existing general plans at the time of permit issuance. This includes activities that are subject to a ministerial or discretionary approval by the County or cities. Most of this type of development is expected to be residential development in areas outside the planning limits of urban growth. This generally occurs in the unincorporated county, but some development may occur within



city limits. For the three cities, San José has the most potential for this type of development in its hillside-designated areas that lie outside of the planning limit of urban growth but within the city limits. Gilroy and Morgan Hill may have some of this type of development as well. Rural development may occur in areas designated in **Figure 2-2** as rural residential or ranchland/woodland land use categories. Rural development is also anticipated in agriculture land use areas as is currently allowed and identified in local general plans.

Rural development activities covered by the Plan are listed below.

- Commercial, industrial, institutional, and recreational development in unincorporated areas of the county, including San Martin, consistent with the County General Plan (County of Santa Clara 1994). This includes County projects at the Mariposa Lodge, James and Holden Ranches, and Muriel Wright Center.
- New intensive agriculture and related activities that require discretionary approval consistent with local general plans, such as mushroom farms, commercial stables, equestrian event facilities, and wineries.
- Rural residential development (e.g., single family homes, subdivisions) consistent with the County General Plan (County of Santa Clara 1994). This may include privately owned bridges, driveways, access roads, vineyards or orchards, and other features commonly associated with rural dwelling units.
- Rural residential development on the non-urban hillsides of eastern San José (outside the planning limit of urban growth) and in the Coyote Valley Urban Reserve and South Almaden Valley Urban Reserve consistent with the San José General Plan.
- Rural residential development in the Morgan Hill Southeast Quadrant consistent with the Morgan Hill General Plan.
- Rural residential development in the Hecker Pass Specific Plan area consistent with the Gilroy General Plan.
- Non-residential development in rural areas that requires approval from the County or cities, such as telecom facilities and small utility outposts. Solar energy projects in rural areas are covered by the Plan as long as their impacts to covered species and natural communities are consistent with the effects evaluation in Chapter 4.

Three projects covered under this Plan in accordance with the first item above are described below.

**Expansion of the Z Best Composting site located at 980 SR 25 south of Gilroy.** The owner, Zanker Road Resource Management, is proposing to expand the composting facility. Preliminary site plans show an expansion of approximately 63.4 acres at full buildout. The expansion plan is divided into four phases.

- Phase 1 expansion of 26.1 acres.
- Phase 2 expansion of 14.0 acres.

- Phase 3 expansion of 11.4 acres.
- Phase 4 expansion of 6 acres.

This project will also include construction of a sedimentation basin of 5.9 acres. The project area is surrounded by agricultural land uses.

**Expansion of the existing Pacheco Pass Landfill located at 3675 Pacheco Pass Highway east of Gilroy.** The landfill is operated by Norcal Waste Systems; the existing use is a composting facility and landfill. This project is currently undergoing CEQA review with the County. The project proposes to expand the facility to construct a 48,160-square-foot (<1-acre) transfer station to house local solid waste and recycling. The transfer station will utilize about 5.25 acres of the approximately 60-acre existing site, excluding use of an access road currently used for the composting and landfill operations on site.

**Expansion of the Freeman Quarry.** The existing Freeman Quarry has been proposed to be expanded. The quarry is located at 3201 Monterey Road on Castro Valley Ranch. The quarry is operated by Granite Construction Company on lands owned by Castro Valley Properties, Inc., and is located approximately 5 miles south of Gilroy. The project is proposed as a 90-acre expansion of the existing 61-acre quarry (final size = 151 acres). The expansion area is proposed to include 56 acres for mining or ancillary uses and 34 acres for overburden placement. The quarry would expand to the north and west of the existing quarry. Overburden would be placed at the far northern end of the expansion area.

Implementation of this project includes the following operational requirements.

- During the rainy season (October 15 through March 31) night hauling activities will not occur between 1 hour before sunset and 1 hour after sunrise if rain is falling. "Rainfall" shall be defined as a measurable amount (0.01 inch or more) of liquid precipitation as measured at the NOAA gauge located in Gilroy, California. If a "chance" of rain, defined by NOAA as >50% probability, is forecasted within 24 hours of scheduled night hauling operations (sunset to sunrise), then all night hauling operations shall be canceled and shall not be recommenced or rescheduled until after sunrise. It is assumed that if rain falls at some time during a calendar day during the rainy season, then the chance of rain is over 50% and night hauling operations will not occur.
- Nighttime lighting during the rainy season will be directed away from habitat for covered amphibians.
- Continue to maintain existing ponds on the project site. Maintenance may include periodic draining of ponds to manage exotic species.

## Private Development Subject to the Plan

All private development activities, including rural development, will be subject to all applicable Plan conditions and fees if they meet the criteria described above

in Section 2.3.2 *Urban Development* subheading *Private Development Subject to the Plan*.

## 2.3.8 Conservation Strategy Implementation

In addition to the projects described above, the Plan will provide take authorization for projects and activities associated with implementation of the Plan's conservation strategy as described in detail in Chapter 5 and summarized below. Most of these activities will take place within the Reserve System assembled by the Plan. Some conservation activities may also occur outside of the Reserve System on public or private lands (see Chapter 5 for a description of all conservation actions).

All conservation actions will take place within the Habitat Plan permit area and the Expanded Study Area and permit area for Burrowing Owl Conservation (**Figure 1-2**), except for the possibility that land will be acquired at the mapped boundary of the Habitat Plan permit area. On parcels acquired for the Reserve System that extend beyond the mapped permit area boundary, management, restoration, and monitoring activities are covered on the entire parcel within unmapped portions of the permit area as long as more than half of each parcel is located within the permit area. These covered activities would occur on no more than a total of 250 acres.

## Management Activities

This category includes all management actions required by the Plan or other actions that might be necessary to achieve Plan biological goals and objectives. This category includes construction, maintenance, and use of facilities needed to manage the Reserves, including but not limited to Reserve field offices, maintenance sheds, carports, roads, bridges, culverts, fences, gates, wells, stock tanks, and stock ponds. All Reserve management structures will be constructed to minimize impacts on covered species and vegetation communities and in compliance with the conditions on covered activities described in Chapter 6. Facilities existing at the time of land acquisition will be used whenever feasible.

Management actions that will be used within the Reserve System are described in detail in Chapter 5 *Conservation Strategy*. Actions not already described earlier in the chapter may include but are not limited to the activities listed below. Many of these activities overlap.

- Vegetation management using livestock grazing, manual labor, and/or prescribed burning. Pesticide use is permitted under the Plan only to achieve biological goals and objectives (e.g., exotic plant or exotic animal control), in accordance with label instructions, and in compliance with state and local laws. Pesticide use is covered only under the NCCP Act permit, not the ESA permit. Implementation of integrated pest management programs established by the local jurisdictions is only a covered activity if pesticides are used to

achieve exotic plant or exotic animal control. Any pesticide use must comply with all existing injunctions related to the use of pesticides. For example, the October 2006 stipulated injunction disallows the use of certain pesticides within habitats and buffer zones established around certain habitats for California red-legged frog and the May 2010 stipulated injunction disallows the use of certain pesticides within habitat and buffer zones established for California tiger salamander, San Joaquin kit fox, and Bay checkerspot butterfly.

- Seed collection from covered plant species for depositing in a seed bank.
- Development of field facilities for workshop space and tool and machinery storage.
- Construction, rehabilitation, and maintenance of facilities (e.g., corrals, fencing, gates, feed storage, water delivery) to support livestock grazing as a covered species management tool.
- Maintenance of existing roads and of new roads constructed for the Reserve System, including grading and relocation of roads to protect sensitive resources.
- Translocation of covered species. See Chapter 5 for details.
- Demolition or removal of structures, roads, or man-made livestock ponds to increase public safety or to restore habitat.
- Use of motorized vehicles for patrolling, maintenance, and resource management activities in the Reserve System.
- Use of mechanized equipment for construction, maintenance, and resource management projects in the Reserve System
- Control of nonnative species (e.g., feral cats and dogs, nonnative pigs, red fox, nonnative fish, bullfrogs, barred tiger salamanders, and hybrids<sup>23</sup>).
- Management activities for burrowing owls such as population augmentation, and owl relocation for conservation purposes.
- Stream maintenance for habitat purposes.
- Installation of wells, the water from which will be used to fill stock ponds or provide water sources for cattle. Up to 49 wells will be installed and placed in close proximity to ponds that they will serve. Wells will be installed only as necessary for natural resource management purposes and when no alternative surface water supplies are available. Wells will be sited so that they do not affect seeps or springs and will not degrade surrounding habitat.
- Surveys and monitoring for mitigation and restoration/habitat enhancement projects.
- Fire management including prescribed burning, mowing, and fuel-break establishment and maintenance.

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<sup>23</sup> See Chapter 5, Section 5.4.2 and **Appendix K**.

- Hazardous materials remediation, such as appropriate closure of underground storage tanks, soil remediation, cleanup of illegal dumping, etc.
- Repair or replacement of existing facilities damaged by floods fire, or earthquake.
- Operations related to water delivery for ponds and other aquatic habitat.
- Water delivery for use in operations facilities (e.g., field facilities and the native plant nursery).

Access to the Reserve System to conduct maintenance, as well as habitat enhancement, restoration and creation projects, will likely require the construction of new roads and bridges. This Plan covers the construction of up to 40 miles of new dirt road and 5 new vehicular bridges within the Reserve System over the permit term. It is not expected that many areas of paved roads will be necessary in the Reserve System and as such, no assumptions for paved roads are included in the impact analysis. However, if the Implementing Entity determines that a certain area requires paving, this would be covered under the Plan, up to 5 miles. To support maintenance activities, it is assumed that approximately 1 well per 1,000 acres of Reserve System will be required and that 53 miles of new fencing will be constructed.

## Public Access and Recreation in the Reserve System

Limited public access and recreational use of Plan reserves is permitted under the guidelines of this Plan (see Chapter 6 for details). To the extent possible, recreational facilities will utilize existing infrastructure such as existing trails and fire or ranch roads. The construction of up to 126 miles of new trails and 25 new trail creek crossings within the Reserve System is assumed in the impact analysis. One new trailhead facility, up to 5.0 acres each, is assumed for every 5,000 acres of newly acquired lands in the Reserve System (not including existing open space incorporated into the Reserve System), resulting in approximately seven new trailhead facilities or 35 acres. It is estimated that new signage will affect 0.25 acre per 1,000 acres of Reserve System.

Covered activities also include the construction and maintenance of recreational facilities such as trails, creek crossings for trails, parking areas, gates, fencing, signage, restrooms, wildlife observation platforms, and educational kiosks that are built and/or used in accordance with the guidelines in this Plan. The Permittees are covered for incidental take of covered species resulting from appropriate public use of trails and parking lots within the permit area, inside or outside of the designated Reserve System, provided that usage is consistent with the guidelines in this Plan. The permits do not cover off-trail recreational activities or any type of activity prohibited by this Plan or by state or federal law.

Up to eight new staging areas, eight new small day-use picnic areas, and three new small backpack camps and their associated staging areas may be allowed within the Reserve System. Picnic areas shall be limited to eight standard picnic benches, restrooms, potable water and trash receptacles. Up to three new

backpack camps to provide low-use, remote camping opportunities within the Reserve System are also covered. These camps will provide restrooms, potable water and trash receptacles.

## Habitat Enhancement, Restoration, and Creation

The Plan conservation strategy (see Chapter 5) sets forth requirements for habitat enhancement, restoration, and creation. Enhancement activities generally fall under the reserve management category. Habitat restoration and creation will generally be disruptive only in the short term because these activities may involve soil disturbance, removal of undesirable plants, and limited grading. All habitat restoration and creation is expected to result in a net long-term benefit for covered species and natural communities. However, these activities may have temporary or short-term adverse effects and may result in limited take of covered species (see Chapter 4 *Impact Assessment and Level of Take*). All habitat enhancement, restoration, and creation activities conducted within Plan reserves that are consistent with the requirements of this Plan are covered by the permits. Habitat enhancement, restoration, and creation activities may also be conducted outside Plan reserves. If such activities occur and are consistent with this Plan, they are covered by the permits. Examples of such activities include restoration projects conducted as mitigation that require additional coverage beyond the self-mitigating aspects inherent to most mitigation projects or restoration of unauthorized trails outside of the Reserve System. Examples of habitat enhancement, restoration, and creation activities include, but are not limited to, the following.

- Pond creation.
- Restoration projects in streams, riparian areas, wetlands, and uplands.
- Native vegetation planting.

## Species Surveys, Monitoring, and Research

Biologists will need to conduct surveys for covered species, natural communities, and other resources within the Plan reserves on a regular basis for monitoring, research, and adaptive management purposes. These surveys may require physical capture and inspection of specimens to determine identity, mark individuals, or measure physical features, all of which may be considered take under ESA or CESA. Surveys for covered species will also be conducted on private land being considered for acquisition for the Plan. Although these surveys are not expected to require as much handling of specimens, take may still occur. Surveys for all covered species will be conducted by qualified biologists, as defined in Chapter 6. All such survey activity consistent with this Plan is covered by the ESA and NCCP permits.

Research conducted by biologists on Plan reserves in support of the Plan is covered by the permits as long as the research projects have negligible effects on populations of covered species. These researchers must be under legal contract

with the Permittee(s) and/or have a Section 10(a)(1)(A) recovery permit to cover incidental take that may occur as a result of research conducted on reserve lands (see Chapter 6 for a more detailed description of a “qualified biologist”). Research on Plan reserves unrelated to the Plan is not covered by the permits because the nature and impacts of these future research projects cannot be predicted at this time. Such researchers would be granted access on a case-by-case basis and such access will be conditioned on compliance with stated restrictions. Research conducted outside of the permit area in support of the Plan’s conservation strategy is also not covered by the Plan (e.g., translocating western burrowing owls into the study area from outside the study area). This research will require coordination and possible permitting from the Wildlife Agencies.

## Emergency Activities

An emergency is a situation involving disasters, casualties, national defense, or security emergencies and includes response activities that must be taken to prevent imminent loss of human life or property (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998). The Wildlife Agencies will not obstruct an emergency response decision made by the Permittees, where human life is at stake. With the exception of changed circumstances addressed in Chapter 10 *Assurances* take associated with emergencies are not covered by the Plan and associated permits.

Responses to changed circumstances within Plan reserves that may affect populations of covered species are covered under this Plan. Foreseeable emergency activities include, but are not limited to, the following.

- Firefighting of small wildfires or structure fires.
- Evacuation of injured persons or livestock.
- Remediation and cleanup of spills or illegal dumping.
- Remediation, cleanup, and restoration of illegal cultivation activities (e.g., marijuana farms).
- Use of motorized vehicles and mechanized equipment for conducting emergency activities.
- Repair of existing facilities damaged by floods, fire, earthquakes, or other natural disasters.

Responses to emergency activities that have substantial effects on covered species (e.g., firefighting for a large wildfire or repair after a major flood) are considered changed circumstances and are described in Chapter 10.

## Neighboring Landowners Protection Program

The implementation of conservation measures described in Chapter 5 *Conservation Strategy* may increase populations of covered species within Plan Reserves. As a result, some individuals may disperse to neighboring private lands where the presence of listed species could interfere with routine agricultural activities. Protections for neighboring landowners are described in Chapter 10; the methods for establishing and estimating take associated with this program are described in Chapter 4. With certain provisions and restrictions, farmlands within 1 mile of the Reserve System boundary are eligible for take coverage during the course of routine agricultural activities, during the permit term, and for take beyond the baseline condition that existed prior to the establishment of the neighboring Plan reserves. Take coverage for this program is limited to three covered species: California red-legged frog, California tiger salamander, and western pond turtle. For definitions and details of this program, see Chapters 4 and 10.

## 2.4 Projects and Activities Not Covered by this Plan

As described above, this Plan strives to cover all projects and activities for which the Permittees envision the need for incidental take coverage over the permit term. However, certain projects and activities that may occur in the permit area over the permit term are not appropriate for coverage under this Plan due to a variety of factors including, but not limited to, lack of information, speculative nature of the project, existing permits, obtaining permits under a separate program, or the risk that the project or activity is incompatible with the Plan's conservation strategy. The projects and activities listed below were considered, but rejected for coverage under this Plan.

- **Private sector activities that do not obtain a development, grading, building, or other construction permit.** Construction permits involve land disturbance for the purposes of making land improvements, such as the construction of buildings, roads, and driveways ("building permits" referenced herein do not include plumbing, electrical, or mechanical permits). Activities that do not obtain these development permits are not covered by the Plan.
- **SCVWD Stream Maintenance Program.** The Stream Maintenance Program was developed to streamline the permitting process for routine stream maintenance activities, thus allowing SCVWD to continue preserving the existing level of flood protection of streams and water-delivery function of canals in the County in an efficient manner. The Stream Maintenance Program was authorized in 2002 and the impact analysis of the program was based on a 20-year study period. Permits received under the program include: Section 7 biological opinions from NMFS and USFWS through the Section 404 Permit, CDFG 1601 Streambed Alteration Agreement, Regional Board Waste Discharge Requirements Permits (Central Coast and San



Francisco Bay Regional Boards), and a San Francisco Bay Conservation and Development Commission (BCDC) permit.

The Stream Maintenance Program provides coverage for the following activities on streams for which SCVWD has maintenance responsibilities.

- ❑ Vegetation management for in-stream and upland areas. Management is done using herbicide and mechanical techniques.
- ❑ Sediment removal to return engineered channels to as-built conditions.
- ❑ Bank protection for erosion control.
- ❑ Minor maintenance activities that avoid significant impacts requiring mitigation. This category includes such activities as graffiti removal, repair of structures with in-kind materials within the existing footprint, and tree pruning along maintenance roads and fence lines to provide access and to remove hazards.

Under the Stream Maintenance Program, routine maintenance is undertaken with consideration of special-status species that may be affected by the activities. Detailed BMPs were developed (and are continually updated through adaptive management) to reduce impacts from program activities, including potential impacts on special-status species. Even after application of BMPs, the program results in significant impacts. Thus, SCVWD is responsible for mitigation associated with its maintenance activities.

As mitigation for the Stream Maintenance Program, SCVWD proposed and obtained approval for a mitigation package that includes restoration of 30 acres of tidal wetlands, creation of 14 acres of freshwater wetlands, purchase of approximately 1,000 acres in the upper watershed areas for stream and watershed protection, and implementation of 125 acres of giant reed (*Arundo donax*) control including removal and follow-up monitoring and removal. Lands restored or purchased will be preserved in perpetuity as open space. In addition, mitigation for bank protection projects is calculated separately for each project. Mitigation is based on the table of ratios in Appendix E of the Stream Maintenance Program document.

The Stream Maintenance Program provides incidental take coverage for five federally listed species, three of which are also covered by this Plan<sup>24</sup>. Existing permits also address impacts on waters of the United States and waters of the state. The current permits are written for 10 years, expiring in 2012. However, the program is anticipated to provide regulatory coverage for federally listed species through 2022. At that time, additional impact analysis of activities would be required to determine whether new significant impacts would result from ongoing routine maintenance. This analysis is needed for negotiation of extensions for the Stream Maintenance Program permits. Because these activities already have endangered species coverage under the Stream Maintenance Program permits, they do not require coverage under the Habitat Plan and will therefore not be covered by this Plan.

<sup>24</sup> Bay checkerspot butterfly, California red-legged frog, least Bell's vireo, salt marsh harvest mouse, and western snowy plover are covered by SCVWD Stream Maintenance Program; the first three are also covered by this Plan.

- **City of Gilroy expansion beyond the Plan's planning limit of urban growth.** The Gilroy General Plan (2002) (City of Gilroy 2002a) designates a number of areas outside the 20-year planning boundary as future areas for development and open space (W. Faus pers. comm.). Policy 2.11 of the Gilroy General Plan designates two areas outside its 20-year planning boundary (the boundary used as the planning limit of urban growth for the purposes of this Plan) as potential areas for future development. These areas are described below.

- The area north of Day Road, west of Santa Teresa Boulevard, and east of the foothills. This area is suitable for long-term residential expansion and related development.
- The area east of U.S. 101 between Buena Vista and Masten Avenue, bordering on the highway. This area is suitable for long-term expansion of highway-oriented commercial development.

Impacts associated with expansion of urban development into these areas were not assessed for this Plan and are not a covered activity of this Plan.

- **Bay Area to Central Valley high-speed train.** The Federal Railroad Administration and the California High Speed Rail Authority are currently planning the San Francisco Bay Area to Central Valley portion of the California High-Speed Train System (70 FR 71370–71372). The proposed alignment for the High-Speed Train System through Pacheco Pass traverses the Plan study area. It is possible that portions, or all, of this alignment could be constructed during the permit term. In such a case, this project would not be covered under this Plan.
- **New highway between I-5 and U.S. 101.** The Metropolitan Transportation Commission's 2030 Regional Transportation Plan lists a "limited-access 4-lane facility and partial new alignment between I-5 and U.S. 101 (possible toll road)" (Metropolitan Transportation Commission 2005). The Regional Transportation Plan does not discuss this project in any detail but provides a preliminary budget of \$432 million. Should this project be pursued during the life of the Plan permit, it would not be covered under the Plan.
- **Routine and ongoing agricultural activities.** Routine and ongoing agricultural activities that do not go through a County or city permitting process (e.g., a grading and/or building permit) would not be subject to local approval and therefore cannot be covered by the Plan. Routine agricultural activities are defined broadly as activities that occur in the normal course of existing farming or ranching operations, including crop planting, crop harvesting, livestock management, and pesticide application. These activities are not covered by the Plan, with the exception of the Neighboring Landowners Protection Program described above and in Section 10.2.7 *Assurances for Private Landowners*.

New intensive agricultural activities such as cut flower nurseries, Christmas tree farms, ornamental plant nurseries, dairies, and feedlots are not covered by this Plan unless these activities receive permits from the County. The conversion of agricultural lands to non-agricultural uses are covered by this Plan as described above in this chapter.

- **Expansion of cultivated agriculture into natural lands.** The expansion of cultivated agriculture into natural lands (as defined by the natural land cover types described in Chapter 3) is not covered by this Plan unless it receives a development or grading permit. This category typically applies to new large-scale agricultural operations such as row crops, vineyards, or orchards. If these land conversions do not require grading, they would typically not require local approvals by the Permittees and therefore cannot be covered by the Plan.
- **Vineyard development that is not assessed by the County through a County permit process.** The creation of new vineyards or expansion of existing vineyards that does not go through a County permitting process (e.g., a grading and/or building permit) would not be subject to local approval and therefore cannot be covered by the Plan. The growth of private and commercial vineyards in Santa Clara County is expected to be low during the permit term, but impacts from vineyards may be significant and incompatible with the conservation strategy. Vineyard impacts include sediment runoff to streams and reductions in local groundwater.
- **Timber harvest operations.** In 2004, approximately 67,000 board feet of timber were harvested in Santa Clara County, down by 40% from 2003 (County of Santa Clara, Division of Agriculture 2005). Most of this harvest occurs on private lands in the Santa Cruz Mountains. Due to the potentially extensive impacts associated with timber harvesting, the lack of understanding about what future projects might be proposed, and the need for some sites to acquire State timber harvesting permits, timber harvesting will not be covered by the Plan.
- **Quarries and other mining other than expansion of Freeman Quarry.** Quarries and other mining were considered for inclusion in this Plan. At the time of Plan development, only one specific project was proposed, the Freeman Quarry expansion. Due to the potentially extensive impacts associated with quarries and mining and the lack of understanding about what future projects might be proposed, the mining of sand or other aggregate material, or the mining of precious metals or other minerals is not covered by this Plan other than for the Freeman Quarry expansion. This exclusion does not include gravel augmentation conducted to enhance fish habitat (described above under Three Creeks HCP conservation strategy) or mining activities associated with the borrow sites for seismic retrofits of dams as described in Section 2.3.3 *In-Stream Capital Projects*. Project proponents who propose any quarries or mining operations in the future in Santa Clara County are recommended to review the 2004 NMFS National Gravel Extraction Guidance for recommendations on how to conduct such activities in and near anadromous fish-bearing streams.
- **New and expanded landfills other than Kirby Canyon, Pacheco Pass Landfill expansions, and landfills occurring inside the planning limits of urban growth of the three cities.** Development of new or expanded landfills was considered for inclusion in this Plan. At the time of Plan development, no specific projects were proposed for inclusion beyond the Kirby Canyon and Pacheco Pass Landfill expansions. Due to the potentially extensive impacts associated with new or expanded landfills and a lack of

understanding about what future projects might be proposed, the development of new or expanded landfills is not covered by this Plan. This does not apply to the expansion of Z Best Composting facility, which is considered a recycling facility under County ordinance.

- **Mercury removal/remediation.** Mercury removal/remediation projects other than those described in Section 2.3.4 *In-Stream Operations and Maintenance* are not covered activities under this Plan. Mercury removal that occurs in the course of sediment removal or dredging projects is covered by the Plan (i.e., projects whose primary purpose is sediment removal, not mercury remediation).
- **Corps led projects.** Projects that are led by the Corps (i.e., the Corps has control over design, avoidance and minimization measures, and mitigation), including levee and flood protection projects, are not covered activities under this Plan. These projects will require a separate Section 7 consultation associated with the Clean Water Act Section 404 permit application process.
- **Pacheco Dam reconstruction and reservoir enlargement.** SCVWD may in the future enlarge Pacheco Reservoir by rebuilding Pacheco Dam or constructing a new dam on Pacheco Creek with substantially more storage. This is one option for SCVWD to respond to the increasing unpredictability and unreliability of water supply in the study area. The project would be located on Pacheco Creek, approximately 1.5 miles upstream of the existing North Fork Dam near the upstream end of Lake Pacheco. Detailed design of this project has not yet begun, nor would it begin for several years to decades. This project is not a covered activity in the Habitat Plan. However, the Plan describes a special major amendment procedure and conservation strategy for terrestrial covered species that could be used by SCVWD if and when this project is proposed. See Chapter 10, Section 10.3.3 *Major Amendments*, for the details of this special amendment process for this project.
- **Pesticide/herbicide application for the federal permit.** Pesticide and rodenticide use is not an activity permitted by USFWS and will not be covered under this Plan for the federal permits. All applicable injunctions stipulated during plan implementation (i.e., 2006 California red-legged frog Stipulated Injunction) will be adhered to until formal consultation between the EPA and USFWS regarding the effects of pesticides on listed species is concluded. This activity is covered under the state permit.
- **Installation and operation of groundwater wells.** The Local Partners do not have a clear regulatory authority over the location of groundwater wells nor water rights associated with wells. In addition, it is very difficult to assess the impacts associated with groundwater well operation. Therefore, except as described above for open space and stream flow management, installation and/or use of groundwater wells will not be a covered activity of this Plan.
- **Increased development due to incorporation of San Martin.** Development associated with the future incorporation of San Martin and subsequent changes to land use and zoning that would allow denser, or

urban, development was not evaluated under this Plan and is not a covered activity.

- **Dam removal and/or construction of new dams.** Dam removal and/or construction of new dams are not covered activities under this Plan.
- **Wind farm development.** Construction and operation of wind farms is not a covered activity under this Plan.
- **Water importation from outside the SCVWD service area.** Importing water from outside of the service area of the SCVWD (County boundary) is not covered under this Plan. The primary source of imported water outside of the County is the Delta, and effects to Delta species were not analyzed in this Plan. Effects associated with imported water from the Delta are currently being evaluated under a Section 7 consultation with the Bureau of Reclamation.
- **Emergency activities not defined as a Changed Circumstance in Chapter 10.** During the permit term, the Local Partners and those under their jurisdiction may need to respond to emergencies, as defined in Section 2.3.8, above. The Wildlife Agencies will not obstruct any emergency response decisions made by the Local Partners. Existing consultation regulations will apply to emergency activities (50 CFR 402.05).



**Table 2-1.** Proposed Land Use Categories and Associated General Plan Land Use Designations

Habitat Plan Category	County of Santa Clara	City of Gilroy	City of Morgan Hill	City of San José
Urban Development	Major Gas & Electric Utilities	Hillside Residential (0.5-4 DU <sup>a</sup> /acre)	Residential Estate (0-1 DU/acre)	Estate Residential (1.0 DU/acre)
	Major Public Facilities	Low Density Residential (3-7.25 DU/acre)	Single Family Low (1-3 DU/acre)	Very Low Density Residential (2 DU/acre)
	Roadside Services	Medium Density Residential (8-16 DU/acre)	Single Family Medium (3-6 DU/acre)	Low Density Residential (5 DU/acre)
	Transportation	High Density Residential (16-30 DU/acre)	Single Family High (5-10 DU/acre)	Medium Low Density Residential (8 DU/acre)
	Major Educational & Institutional Uses	Neighborhood District (6-12.5 DU/acre)	Multi Family Low (5-14 DU/acre)	Medium Density Residential (8-16 DU/acre)
		Neighborhood Commercial	Multi Family Medium (14-21 DU/acre)	Medium High Density Residential (12-25 DU/acre)
		Professional Office	Multi Family High (21-40 DU/acre)	High Density Residential (25-50 DU/acre)
		Shopping Center Commercial	Commercial	Transit Corridor Residential (20+ DU/acre)
		Highway Commercial	General Commercial	Transit/Employment Residential District: 55+ DU/acre
		Commercial Industrial	Non-Retail Commercial	Residential Support for the Core Area (25+ DU/acre)
		Downtown Specific Plan Districts	Mixed Use	Planned Community
		Campus Industrial	Industrial	Urban Reserve (future development)
		Limited Industrial	Office Industrial	Mixed Use Overlay
		General Industrial	Campus Industrial	Mixed Industrial Overlay
		Park/Public Facilities	Public Facilities	Neighborhood/ Community Commercial
			Rural County (usually 1 DU/5-20 acres) <sup>b</sup>	Regional Commercial
				General Commercial
				Core Area
				Combined Residential/Commercial Office
				Transit-Oriented Development Corridor
				Industrial Park
				Administrative Office/Research & Development

Table 2-1. Continued

Habitat Plan Category	County of Santa Clara	City of Gilroy	City of Morgan Hill	City of San José
				Research/Development Campus Industrial Light Industrial Heavy Industrial Combined Industrial/ Commercial Industrial Core Airport Approach Zone Public/Quasi-Public
Rural Residential	Rural Residential (1 DU/5-20 acres)	Rural Residential (maximum of 1 DU/2.5 acres) Hecker Pass Special Use District		Rural Residential (1 DU/5 acres) Urban Hillside (1 DU/5 acres)
Ranchland	Ranchlands (1 DU/20-160 acres) Hillsides (1 DU/20-160 acres)			Non-Urban Hillside (1 DU/20-160 acres)
Agriculture	Agriculture Large Scale Agriculture Medium Scale	Agricultural Commercial Agri-tourist Commercial Agri-tourist Commercial Overlay		Agriculture Coyote Greenbelt Overlay
Urban Parks and Open Space		Open Space (in part) Park/Recreation Facility	Open Space (in part)	Public Park/Open Space (in part) Private Open Space (in part) Private Recreation (in part) Floating Park overlay
Rural Parks and Open Space	Baylands Open Space Reserve Other Public Open Lands Regional Parks, Existing	Open Space (in part)	Open Space (in part)	Public Park/Open Space (in part) Private Open Space (in part) Private Recreation (in part)
Notes				
<sup>a</sup> DU = dwelling units				
<sup>b</sup> Morgan Hill anticipates that existing land use designations of Rural County, currently falling within the development density for the Rural Residential land use category, will, over the course of the permit term, become denser. Therefore Morgan Hill's Rural County land use designation is included in the Urban Development land use category for this Plan.				



**Table 2-2.** Significant Open Space or Parkland Areas within the Study Area<sup>a</sup>

Open Space or Parkland	Primary Ownership (acres)	Other Ownership	Total Acres	Total Acres in Study Area
(unnamed parcels)	United States Bureau of Land Management		1,025	989
Cañada de los Osos Ecological Area (formerly Stevenson Ranch)	California Department of Fish and Game		4,200	4,200
Almaden Quicksilver County Park	County of Santa Clara Parks and Recreation Department (3,943)	SCVWD owns 209 acres	4,152	4,138
Anderson Lake County Park	County of Santa Clara Parks and Recreation Department (1,773)	SCVWD owns 1,339 acres	3,144	3,144
Calero County Park	County of Santa Clara Parks and Recreation Department (2,603)	SCVWD owns 890 acres	4,455	4,442
Coyote Creek Parkway	County of Santa Clara Parks and Recreation Department (1,613)	SCVWD owns 81 acres	1,694	1,694
Coyote Lake-Harvey Bear Ranch County Park	County of Santa Clara Parks and Recreation Department (3,663)	SCVWD owns 932 acres	4,595	4,595
Ed R. Levin County Park	County of Santa Clara Parks and Recreation Department (1,541)		1,541	973
Joseph D. Grant County Park	County of Santa Clara Parks and Recreation Department (9,560)		9,560	9,560
Motorcycle County Park	County of Santa Clara Parks and Recreation Department (442)		442	442
Mount Madonna County Park	County of Santa Clara Parks and Recreation Department (3,677)		3,677	3,669
Santa Teresa County Park	County of Santa Clara Parks and Recreation Department (1,568)	SCVWD owns 9 acres	1,646	1,646
Uvas Canyon County Park	County of Santa Clara Parks and Recreation Department (1,133)		1,133	1,127
Palassou Ridge Open Space Preserve	Santa Clara County Open Space Authority		3,515	3,515
Rancho Cañada del Oro Open Space Preserve	Santa Clara County Open Space Authority		3,602	3,602

Table 2-2. Continued

Open Space or Parkland	Primary Ownership (acres)	Other Ownership	Total Acres	Total Acres in Study Area
Sierra Vista Open Space Preserve	Santa Clara County Open Space Authority		1,676	1,676
Mitigation site	Santa Clara Valley Transportation Authority		603	603
Alum Rock Park	City of San José		703	703
Kirby Landfill easement	City of San José		250	250
Coyote Ridge Ecological Preserve	Silicon Valley Land Conservancy		95	95
Tulare Hill Ecological Preserve	Silicon Valley Land Conservancy		116	116
Blue Oak Ranch Reserve	University of California Natural Reserve System		1,319	706
Romero Ranch	The Nature Conservancy		28,781	10,674
San Felipe Ranch (conservation easement)	Easement held by The Nature Conservancy		28,359	24,983
Silacci Ranch (conservation easement)	Easement held by The Nature Conservancy		1,388	1,388

Sources: Santa Clara County Open Space Authority 2005, 2012; Silicon Valley Land Conservancy 2006; County of Santa Clara, Parks and Recreation Department 2006a; County of Santa Clara, Parks and Recreation Department 2006b; The Nature Conservancy 2006.

Notes:

<sup>a</sup> Significant open space or parklands are large areas or highly biologically valuable that may support the Plan's conservation strategy.

**Table 2-3.** Examples of Open Space Types<sup>a</sup> in the Study Area

Type 1 Open Space	Type 2 Open Space	Type 3 Open Space	Type 4 Open Space
<ul style="list-style-type: none"> <li>• Properties under easement managed by The Nature Conservancy</li> <li>• Santa Clara Valley Open Space Authority properties under easement or other protections from change in land use</li> <li>• Designated biological mitigation sites under easement</li> <li>• Private property under conservation easement with the primary purpose of ecological protection</li> </ul>	<ul style="list-style-type: none"> <li>• Santa Clara Valley Water District watershed protection areas</li> <li>• Santa Clara Valley Open Space Authority properties without permanent protections or where protections are uncertain or pending</li> <li>• City of San Jose rural parks and open space</li> <li>• San Francisco Public Utilities Commission watershed lands</li> <li>• Bureau of Land Management properties</li> </ul>	<ul style="list-style-type: none"> <li>• Santa Clara County Parks and Recreation Department rural parks</li> <li>• Santa Clara County historic sites or recreation areas</li> <li>• Santa Clara County urban creek parks</li> </ul>	<ul style="list-style-type: none"> <li>• Private properties under agricultural easement (cropland)</li> <li>• Golf courses</li> <li>• Urban parks or open space owned by cities</li> </ul>

Notes:

<sup>a</sup> See Figure 2-3 and Chapter 2 for definitions of open space types.

**Table 2-4.** Dry and Wet Season Maximum and Minimum Covered Reservoir Dewatering Flows for SCVWD Reservoirs for the Purpose of Triggering Additional Wildlife Agency Approval Requirements

Reservoir	Allowable Daily Dewatering Flows (cfs) <sup>1</sup>			
<b>Dry Season</b> (May 1 to October 31, 184 days)	Minimum <sup>2</sup>	Average <sup>3</sup>	Maximum	Outlet Capacity (cfs)
Almaden <sup>4</sup>	1	5	10	190
Anderson <sup>5</sup>	3	50	50	100 (550)
Calero <sup>4</sup>	1	15	20	75
Coyote <sup>4</sup>	2	34	49	450
Guadalupe <sup>5</sup>	1	10	10	235
Chesbro	1	10	20	740
Uvas	1	32	39	165
<b>Wet Season</b> (November 1 to April 30, 181 days)	Minimum	Average <sup>3</sup>	Maximum <sup>7,8</sup>	Outlet Capacity (cfs)
Almaden <sup>4</sup>	1	59	190	190
Anderson <sup>5,6</sup>	5	467	550	100 (550)
Calero <sup>4</sup>	1	31	75	75
Coyote <sup>4</sup>	2	202	450	450
Guadalupe <sup>5</sup>	1	28	235	235
Chesbro	1	79	740	740
Uvas	2	165	165	165

Notes:

<sup>1</sup> Flows are based on one year dewatering program beginning May 1 with a dewatered reservoir by April 30. Average flows are those releases that can dewater the reservoir in the one year timeframe and are based on wet year conditions beginning with a full reservoir (Scenario 3).

<sup>2</sup> Minimum flows are provided for lower limit to indicate no stream dry-back.

<sup>3</sup> Average flow is based on the daily average flow over the entire period during which the reservoir is dewatered beginning with a full reservoir on May 1 and an inflow of 10% exceedance probability.

<sup>4</sup> Reservoirs with fish management objectives.

<sup>5</sup> Reservoirs with cold water and fish management objectives.

<sup>6</sup> Maximum winter flow releases could be made per the flood rule curves, per DSOD restriction, pulse flows, or when they mimic natural hydrology.

<sup>7</sup> Anderson Dam flows between 100 cfs and 550 cfs can be made by delivering water to treatment plants in addition to releasing water to the stream. Pumping would be required.

<sup>8</sup> Pulse flows implemented for the benefit of anadromous fish species (see Section 2.3.4) may be greater than the flows anticipated for draining of a reservoir as part of a dewatering event. These higher flows are also covered by this Plan. Implementation of pulse flows may require additional regulatory approval (i.e., NMFS and CDFG for federal- and state-listed fish species).

**Table 2-5.** Existing Interim Storage Restrictions for SCVWD Dams

Dam	DSOD Storage Restrictions as of October 31, 2011 <sup>1</sup>
Almaden Dam	20%
Anderson Dam	31%
Chesbro Dam	none
Coyote Dam	48%
Calero Dam	54%
Guadalupe Dam	35%
Uvas Dam	none
Vasona Dam	none

<sup>1</sup> Percentages reflect reduction in current reservoir capacity, not new operating capacity.

Source: Arnold pers. comm.; Showalter pers. comm., D. Caldon pers. comm.

**Table 2-6.** Specific Transportation Projects that are Covered by the Plan

Project	Approximate Length in Permit Area (miles)	Approximate Width of New Construction (feet)	Lead Agency
<b>County Roadway Projects (includes extensions, new connections, realignments, and widenings)</b>			
<i>Ferguson/New North-South Corridor</i>			
Ferguson Road widening (SR 152E to Leavesley Road)	1.8	24.0	Santa Clara County
New Avenue widening (Leavesley Road to Buena Vista Avenue)	1.4	24.0	Santa Clara County
New Avenue widening (Buena Vista to San Martin Avenue)	3.6	20.0	Santa Clara County
New Avenue realignment at approach to San Martin Avenue	0.2	46.0	Santa Clara County
<i>Marcella/Center/Hill/Peet North-South Corridor</i>			
Marcella Avenue widening and removal of short zig-zag in road (Leavesley Road to Buena Vista Avenue)	1.6	24.0	Santa Clara County
Center Avenue extension/new connection (Omar Avenue to Buena Vista Avenue; requires a new stream crossing)	0.2	92.0	Santa Clara County
Center Avenue widening (Omar Street to just south of Maple Avenue)	5.1	24.0	Santa Clara County
Center Avenue and Hill Road new connection at Maple Avenue	0.2	92.0	Santa Clara County
Hill Road widening (Dunne Avenue to E. Main Avenue) – along border of Morgan Hill planning limit of urban growth	1.2	24.0	Santa Clara County
Hill Road extension/new connection (East Main Avenue to Half Road and Peet Road new connection to Half Road – along border and inside of Morgan Hill planning limit of urban growth)	0.6	92.0	Santa Clara County
<i>Monterey Road North-South Corridor</i>			
Monterey Road widening (Watsonville Road to Masten Avenue/Fitzgerald Avenue)	4.4	24.0	Santa Clara County
<i>Santa Teresa/Hale Corridor (includes Sunnyside and DeWitt)</i>			
Santa Teresa Boulevard widening (Castro Valley Road to 10 <sup>th</sup> Street/Thomas Road) – along border of Gilroy planning limit of urban growth	1.3	24.0	Santa Clara County
Santa Teresa Boulevard widening (Day Road/Buena Vista Avenue to Watsonville Road)	5.0	24.0	Santa Clara County
DeWitt Avenue new connection to W. Edmundson Avenue and Sunnyside Avenue intersection	0.4	92.0	Santa Clara County

Table 2-6. Continued

Project	Approximate Length in Permit Area (miles)	Approximate Width of New Construction (feet)	Lead Agency
DeWitt Avenue widening and removal of small "S" curve (North of W. Edmundson Avenue to Spring Avenue)	0.7	24.0	Santa Clara County
Hale Avenue widening (Morgan Hill planning limit of urban growth border [0.8 miles south of Tilton] to Palm Avenue)	3.3	24.0	Santa Clara County
<i>Uvas/McKean/Almaden North-South Corridor</i>			
Uvas widening – to vary between adding center turn lane and widening shoulders (Watsonville Avenue to McKean Road/Bailey Avenue)	9.8	8.0 to 20.0	Santa Clara County
McKean Road widening (Bailey Avenue to Almaden Road) includes curve realignment at Calero Reservoir Park	4.2	24.0	Santa Clara County
McKean Road extension/new connection to Almaden Expressway – along border and inside of San José planning limit of urban growth	0.2	92.0	Santa Clara County
<i>East-West Corridors</i>			
Leavesley Road Widening (Ferguson Road to Marcella Avenue) – along border of Gilroy planning limit of urban growth	1.3	24.0	Santa Clara County
Masten Avenue widening (U.S. 101 to Monterey Road) – along border of Gilroy planning limit of urban growth	0.7	24.0	Santa Clara County
Fitzgerald Avenue widening (Monterey Road to Santa Teresa Boulevard) – along border of Gilroy planning limit of urban growth	0.7	24.0	Santa Clara County
Fitzgerald Avenue approach to Monterey Road, realignment 30 feet north to create a perpendicular intersection – along border of Gilroy planning limit of urban growth	<0.1	30.0	Santa Clara County
San Martin Widening (U.S. 101 to Santa Teresa Boulevard)	1.4	24.0	Santa Clara County
<b>Interchange Projects</b>			
U.S. 101 at Buena Vista Interchange	0.4/0.3	700	Santa Clara Valley Transportation Authority
U.S. 101 at Coyote Valley Parkway Interchange	0.2/0.4	150	Santa Clara Valley Transportation Authority
U.S. 101 at East Middle Interchange	0.3/0.3	900	Santa Clara Valley Transportation Authority
SR 152 and SR 156 Interchange	0.3/1.0	100	Santa Clara Valley Transportation Authority

Project	Approximate Length in Permit Area (miles)	Approximate Width of New Construction (feet)	Lead Agency
<b>Highway Projects</b>			
U.S. 101 Improvement Project (Monterey Road to SR 129; VTA ID H101-22) includes extending Santa Teresa Boulevard from Castro Valley Road to U.S. 101 (requires a new stream crossing) <sup>1</sup>	12.9	100	Santa Clara Valley Transportation Authority
U.S. 101 widening between Cochrane Rd. and Monterey Hwy (VTA ID H101-23)	5.1	32	Santa Clara Valley Transportation Authority
S.R. 237 HOV/HOT lane (full length inside the study area) – includes converting the existing median to express lanes	2.3	32	Santa Clara Valley Transportation Authority
S.R. 85 HOV/HOT lane (full length inside the study area) – includes converting the existing median to express lanes	11.6	32	Santa Clara Valley Transportation Authority
U.S. 101 HOV/HOT lane (western study area boundary to Cochrane Road) – includes converting the existing median to express lanes <sup>2</sup>	26.7	32	Santa Clara Valley Transportation Authority
U.S. 101 HOV/HOT lane (Cochrane Road to Masten Avenue; VTA ID H6) – includes converting the existing median to express lanes	7.5	32	Santa Clara Valley Transportation Authority
U.S. 101 HOV/HOT lane (Masten Avenue to 10 <sup>th</sup> Street; VTA ID H7) – includes converting the existing median to express lanes	4.2	32	Santa Clara Valley Transportation Authority
U.S. 101 HOV/HOT lane (10 <sup>th</sup> Street to SR 25; VTA ID H8) – includes converting the existing median to express lanes	3.0	32	Santa Clara Valley Transportation Authority
<b>Mass Transit Projects</b>			
Caltrain South County—double tracking from San José to Gilroy (VTA ID T6)	10.4	14	Santa Clara Valley Transportation Authority

<sup>1</sup> Only the portion of this project in Santa Clara County is covered by the Plan. Mitigation for the portion of the project in San Benito County could be accomplished through the Habitat Plan, consistent with the portion of the project in Santa Clara County. Mitigation required for the San Benito County portion of the project would be additive to the requirements of the Habitat Plan for the Santa Clara County portion.

<sup>2</sup> Only the portion of this project in the study area is covered by the Plan. Mitigation for the portion of the project outside of the study area could be accomplished through the Habitat Plan, consistent with the portion of the project in the study area. Mitigation required for the portion outside of the study area would be additive to the requirements of the Habitat Plan for the study area portion.

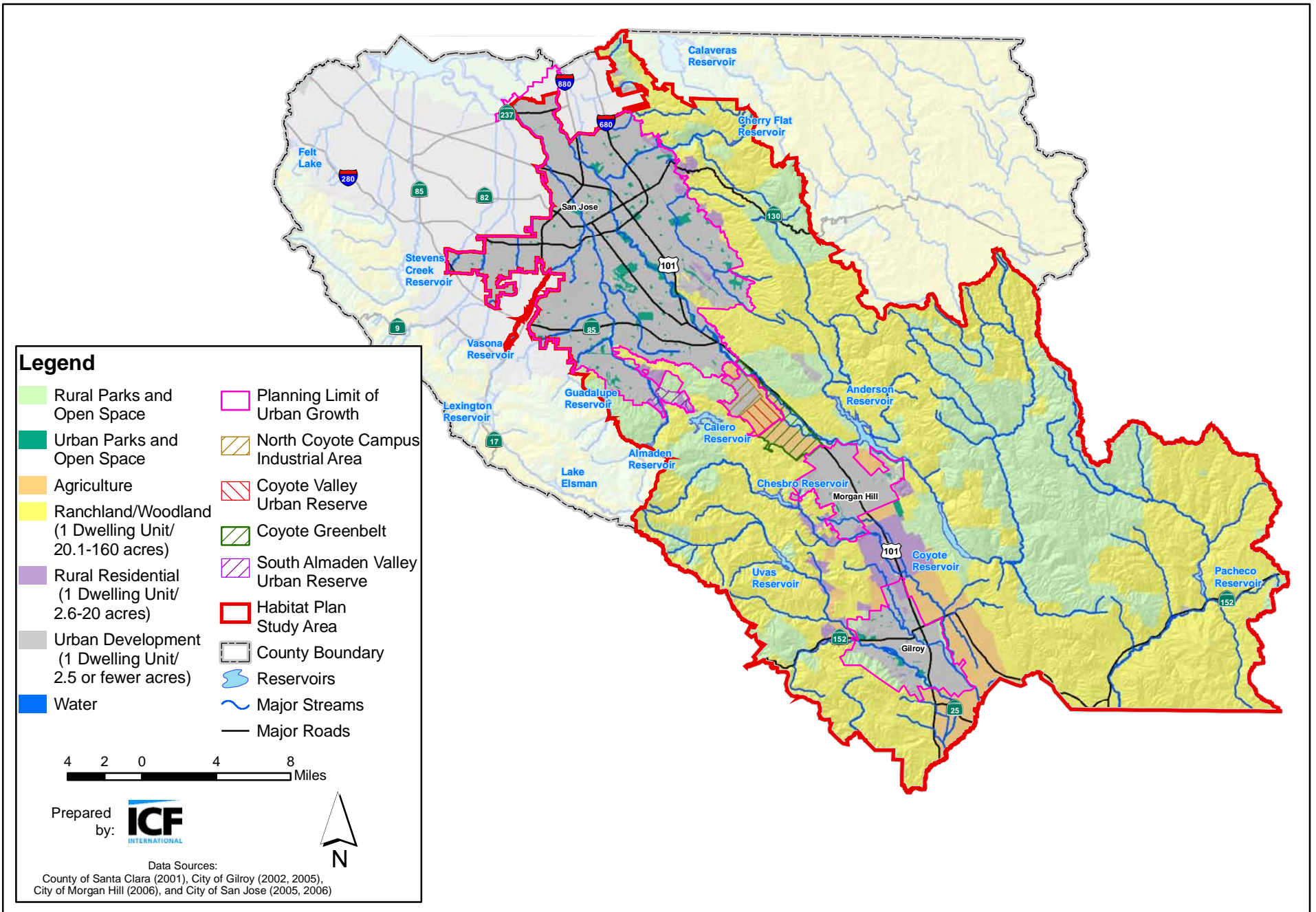
Sources: Santa Clara Valley Transportation Authority 2009; D. Cameron pers. comm. b.





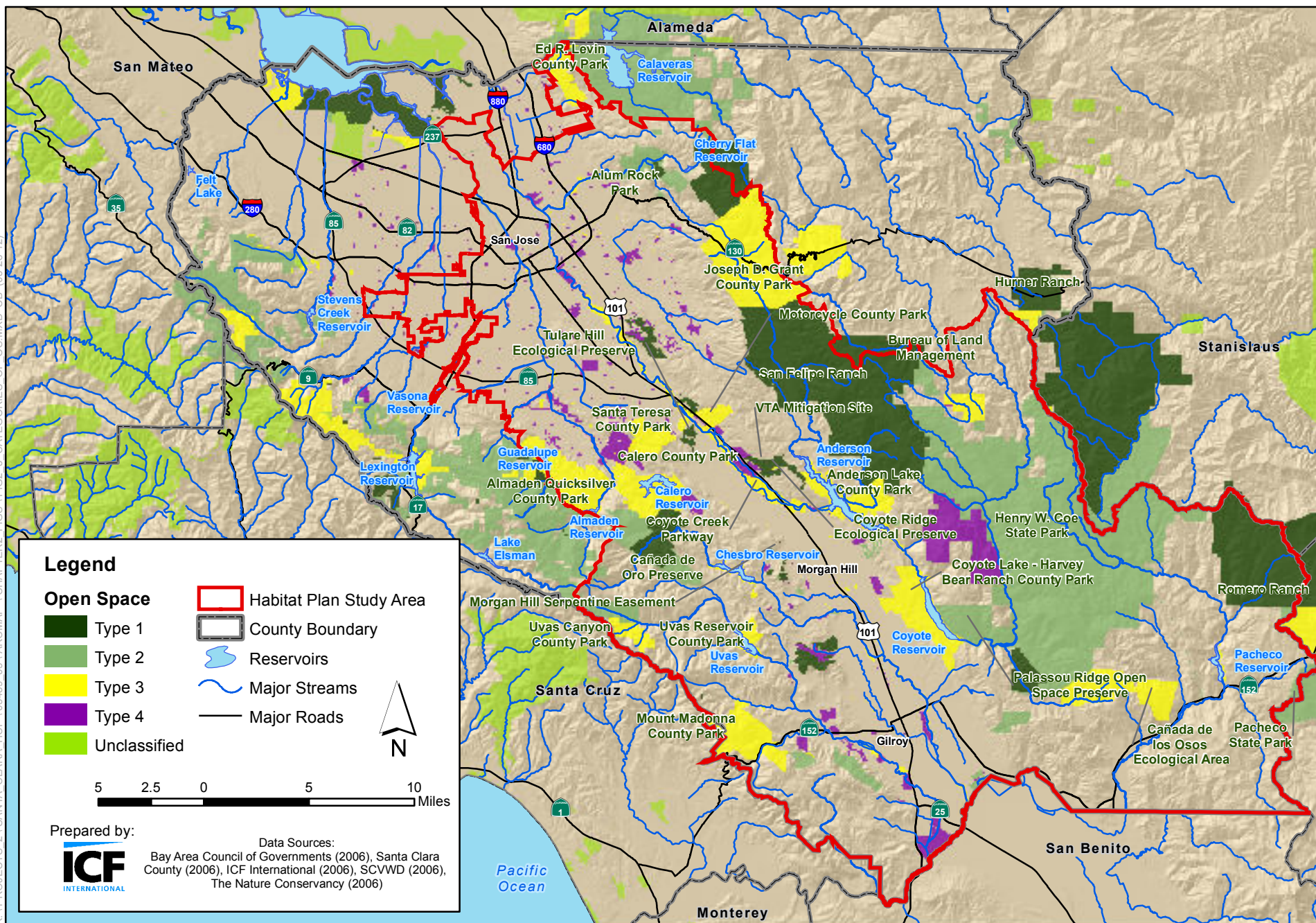
Source: SCVWD.

**Figure 2-1**  
**Santa Clara Valley Water District Water Conveyance, Treatment, and Distribution System**

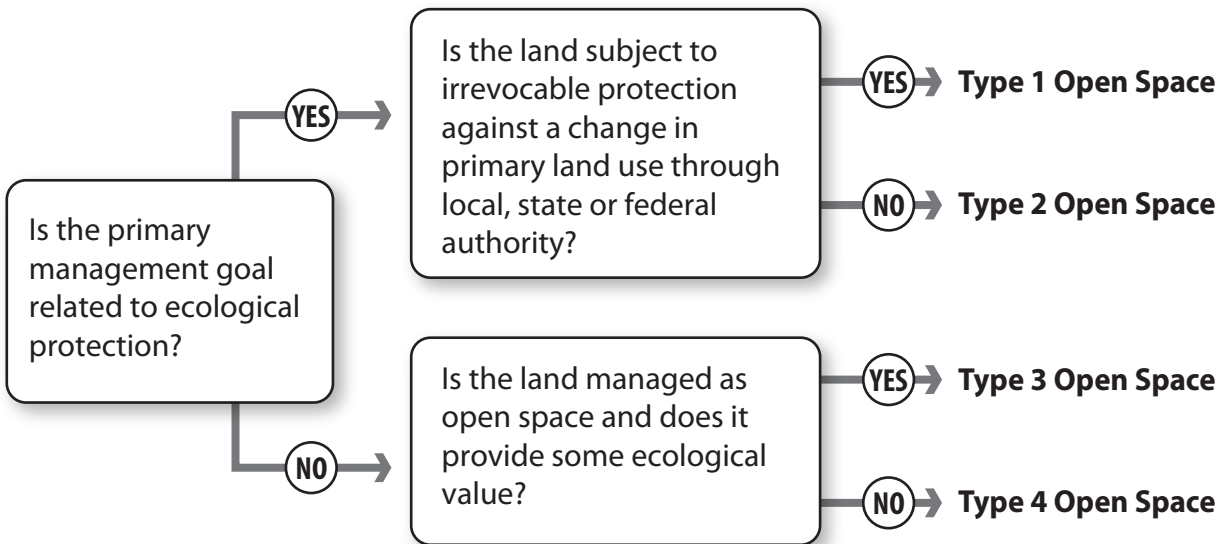


**Figure 2-2**  
**Santa Clara Valley Habitat Plan Land Use Categories**





**Figure 2-3**  
**Open Space Categories in the Santa Clara Valley Habitat Plan Study Area**



## Criteria

### Type 1 Open Space

- 1) The primary management goal is related to ecological protection.
- 2) That protection is irrevocable through local, state or federal authority and there are legal assurances such as wilderness status or a conservation easement that the primary land use will never change.

### Type 2 Open Space

- 1) The primary management goal is related to ecological protection.
- 2) The land is not subject to irrevocable protection from a change in primary land use or protections are uncertain or political in nature.

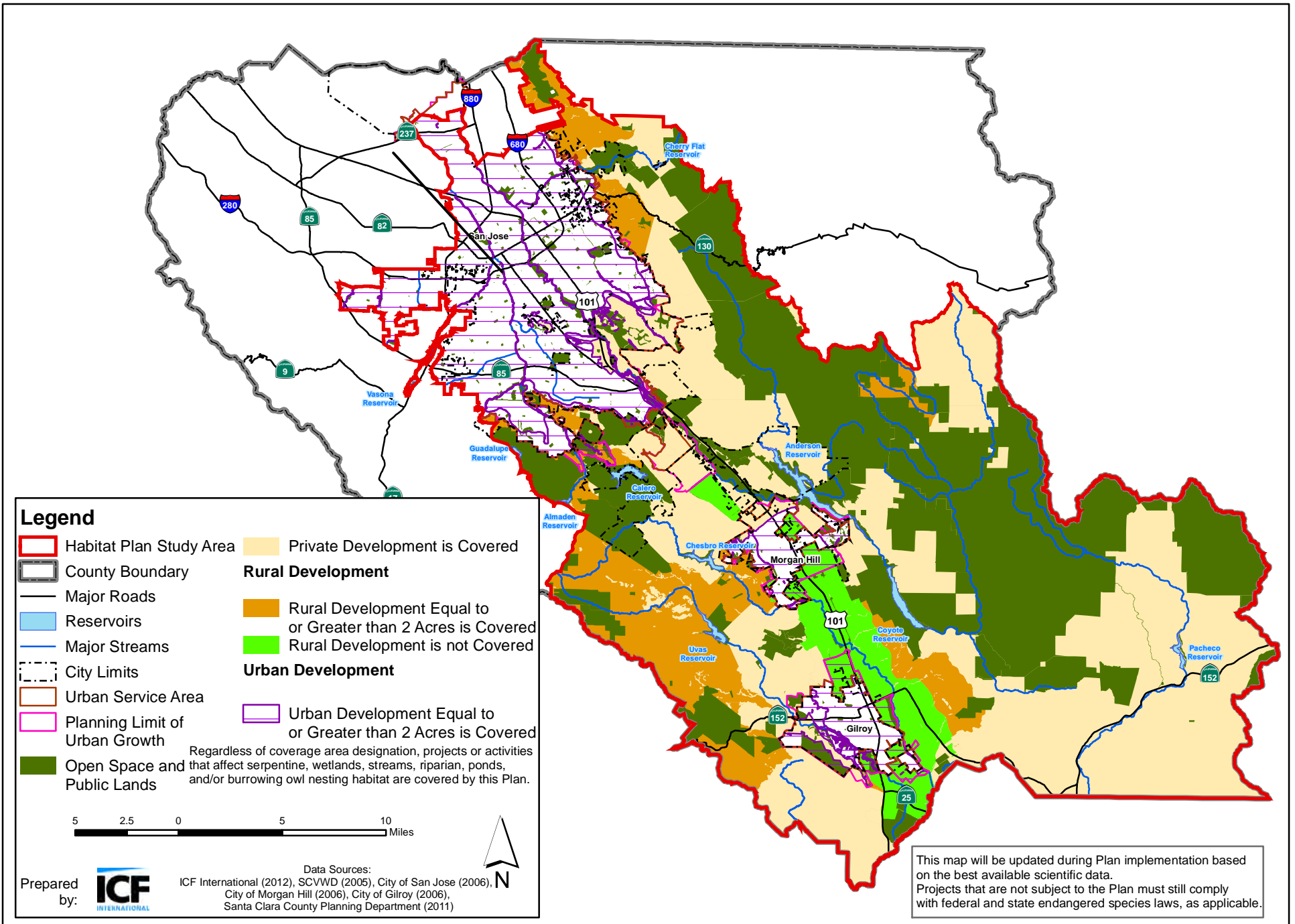
### Type 3 Open Space

- 1) Ecological protection is not a primary management goal, but land is managed as open space and has a consistent and measurable ecological value (allows multiple species to complete some portion of their life cycle [e.g. reproduction, growth, foraging] or provides critical refuge and movement opportunities [e.g. migration corridor]).

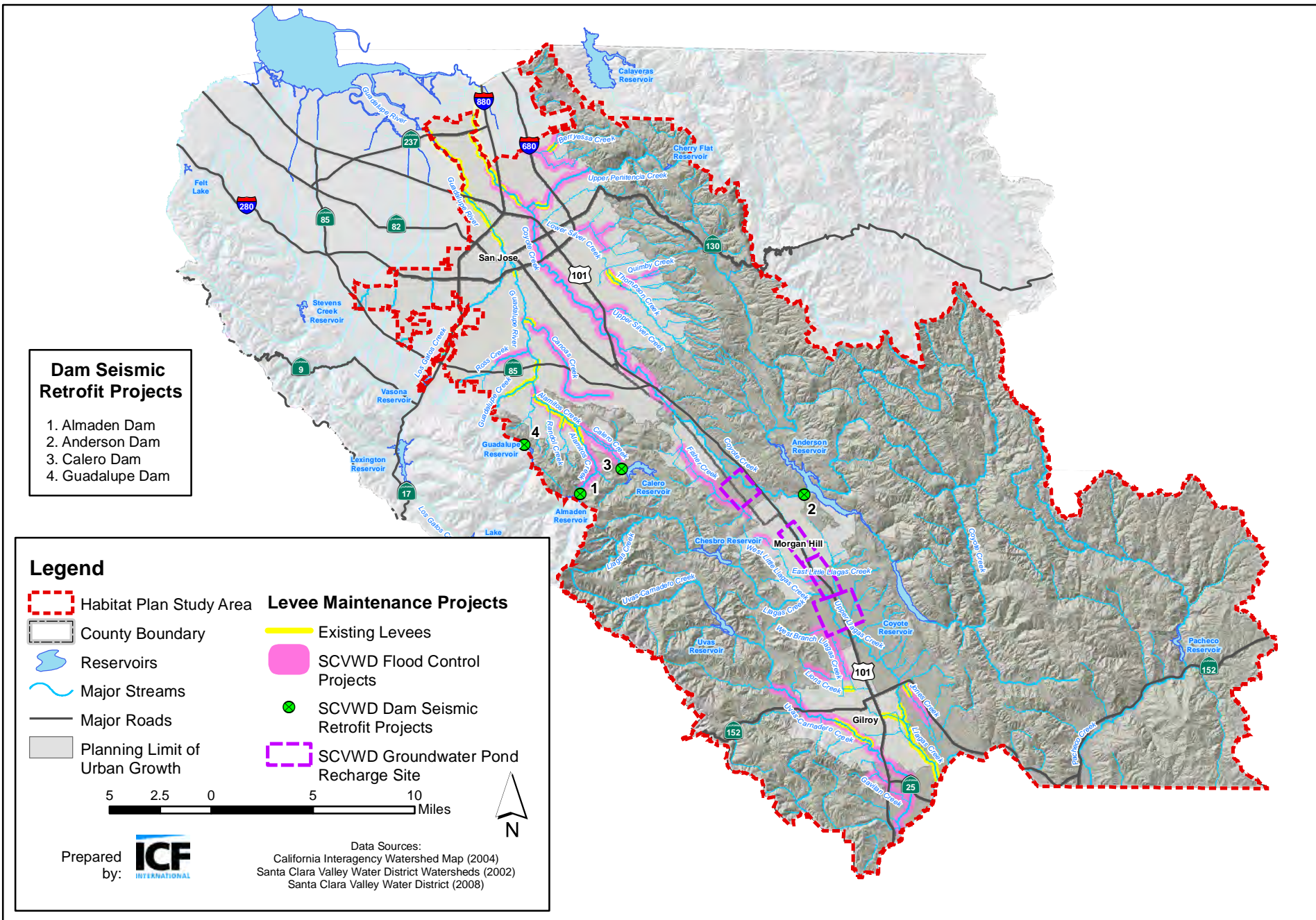
### Type 4 Open Space

- 1) The land is undeveloped but current management goals do not promote any consistent or measurable ecological value.



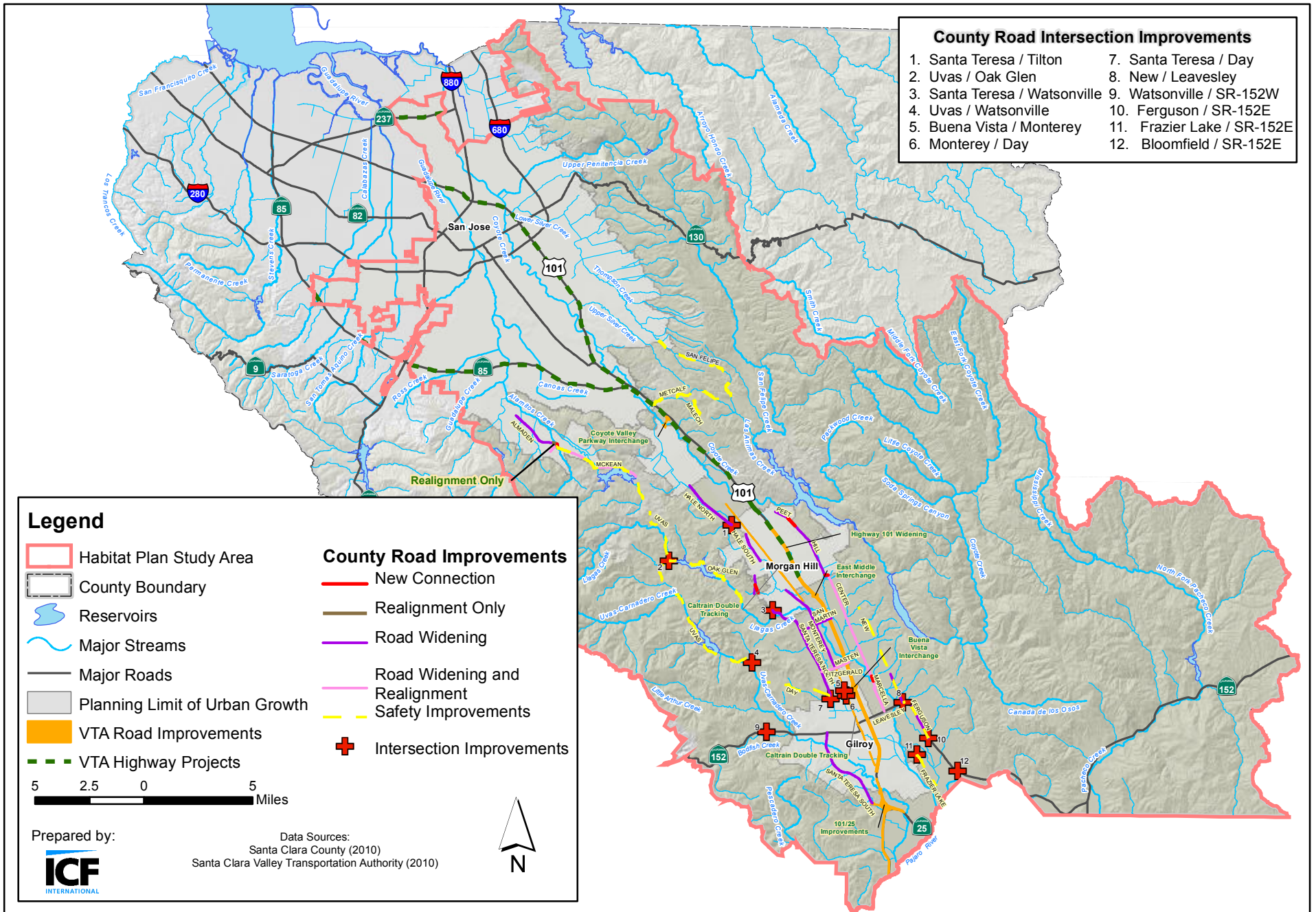


**Figure 2-5**  
**Private Development Areas Subject to the Plan**



**Figure 2-6**  
**SCVWD Capital Projects**









## Chapter 3

# Physical and Biological Resources

### 3.1 Introduction

This chapter presents an overview of the physical and biological setting of the Plan study area. It describes the baseline physical and biological conditions upon which the impact analyses (Chapter 4 *Impact Assessment and Level of Take*) and conservation strategy (Chapter 5 *Conservation Strategy*) are based. The chapter also describes how existing data were used and new data were collected to create the baseline inventory. The physical setting of the study area is described in the context of the following subject areas.

- Location.
- Topography.
- Geology and soils.
- Climate and hydrology.
- Data sources and methods.

The biological setting of the study area is described in terms of the following subject areas.

- Land cover types.
- Associated wildlife and plants.
- Ecosystem function.
- Natural disturbances.
- Threats to each natural community.

The ecology and distribution of covered species are described along with species-habitat models that define the suitable or potential habitat for most covered species (**Appendix D**).

This chapter also explains how the land cover types, habitats, disturbances, ecosystem services, and current management of the lands are inter-related to provide a context for the management of the Reserve System described in Chapter 5.

## 3.2 Physical Setting

This section describes the physical setting of the study area including location, topography, geology and soils, hydrology, climate and watersheds.

### 3.2.1 Location

The Plan study area (519,506 acres) is located in Santa Clara County in the central California Coast Range<sup>1</sup>. The primary valley in the study area is the Santa Clara Valley, which stretches from San Francisco Bay to San Benito County. The Santa Clara Valley is bounded on the east by the Diablo Range, on the west by the Santa Cruz Mountains, and on the north by the San Francisco Bay shoreline. The study area excludes tidally influenced portions of the Baylands (**Figure 1-2**). For a description of the political, ecologic, and hydrologic factors used to define the study area, see Chapter 1 *Introduction*.

### 3.2.2 Topography

#### Overview

The Santa Clara Valley is the southerly, on-land portion of a regional topographic depression that includes San Francisco Bay as well as the Petaluma, Sonoma, and Napa Valleys to the north (Norris and Webb 1990). Roughly hourglass in shape, the Santa Clara Valley is approximately 11 miles wide at the southern end of San Francisco Bay, narrowing to a minimum of about 2.5 miles north of Morgan Hill.<sup>2</sup> The Santa Clara Valley extends south to the county line, where it widens to approximately seven miles and merges with the Bolsa and Hollister Valleys in San Benito County. The valley floor is nearly flat along the Bay, with gentle undulations and local, low hills to the south. Valley floor elevations increase from sea level in the north to approximately 350 feet above mean sea level (msl) at the valley's narrowest point north of Morgan Hill (**Figure 3-1**). This low "saddle" in the valley represents the watershed divide between the Coyote Valley Watershed in which streams flow north to San Francisco Bay, and the watersheds to the south in which streams flow south to the Pajaro River and ultimately to Monterey Bay (see *Watersheds* below for watershed descriptions).

On the west side of the valley, the Santa Cruz Mountains rise to a maximum elevation of almost 4,000 feet msl. Typical of the Coast Ranges, the range trends

<sup>1</sup> State Parks lands (Henry W. Coe State Park and Pacheco State Park) fall within the study area; however they are excluded from the permit area. As such, all of the land cover-based analyses in the Plan are based on the study area less State Parks lands unless otherwise noted. The size of the study area less State Parks lands is 460,205 acres.

<sup>2</sup> The narrowest portion of Santa Clara Valley is also referred to as Coyote Valley, and Coyote Valley is sometimes considered a separate geomorphic entity from the Santa Clara Valley. This Plan considers Coyote Valley a part of the greater Santa Clara Valley.

northwesterly and is characterized by steep, rugged slopes and abrupt, deeply incised drainages. The steepest interior portions of the range are bounded along the valley floor by more gently sloping foothills largely representing dissected alluvial fan geomorphology.

On the east side of the valley, the Diablo Range forms a similarly rugged barrier, flanked by more gently sloping but strongly dissected alluvial foothills. Like the Santa Cruz Mountains, the Diablo Range is a long, northwest-trending uplift characterized by extremely rugged topography and heights in excess of 1,000 feet. The highest peak in the range is Mt. Hamilton (4,213 feet msl), in Santa Clara County but immediately east of the study area. Other important peaks in the study area include, from north to south, Monument Peak (2,594 feet msl) at the County line, Mt. Madonna (1,897 feet msl), and Pacheco Peak (2,770 feet msl). Elevations in the study area are generally greatest within the Diablo Range, particularly in the southeast portion of the study area. The highest point in the study area is 3,777 feet msl within Henry W. Coe State Park (**Figure 3-1**). The highest point in the Santa Cruz Mountains within the study area is 3,644 feet msl (**Figure 3-1**).

## Slope and Aspect

The rugged topography of the study area creates highly variable slopes and aspects. Slope may provide some insight to the type of land cover that could be present. Moreover, it is often incorporated into zoning restrictions as a function of a parcel's buildability. **Figure 3-2** shows the range and location of slope in the study area. Aspect is expressed as an azimuth (compass bearing) representing the direction normal to the plane that approximates the slope. South and southwest-facing slopes tend to receive the greatest amount and intensity of solar radiation in the study area, which can greatly influence vegetation and species occurrence. North and northeast-facing slopes are often the coolest aspects, all else being equal. Note the predominance of generally northeast- and southwest-facing slopes, consistent with the overall northwesterly trend of the ranges (**Figure 3-2**).

### 3.2.3 Geology

The geology and fault zones of the study area have an important influence on the distribution of landforms and soil types, which in turn influence vegetation and plant species distribution and abundance. In some cases, geology and soils also greatly influence wildlife species distribution. For example, many invertebrates are closely associated with particular plant species or vegetation types that are restricted to particular soil types and geologic substrates. On a regional scale, geologic activity has also greatly influenced the pattern of stream formation and the structure and function of local watersheds<sup>3</sup>.

<sup>3</sup> Faults can also be an important source of groundwater for stream flow, particularly in droughts. In severe droughts (e.g., 1976–1977), stream reaches in or near faults were often the only local perennial stream habitat, serving as

## Faulting

Topography in the study area largely reflects active tectonics associated with the fault system of the San Andreas plate boundary.

The Santa Cruz Mountains are being uplifted along a system of faults related to the San Andreas plate-boundary system (Kennedy and Hitchcock 2004). The San Andreas fault zone itself, the primary fault within the system, lies northwest along the east flank of the uplift (e.g., Wagner et al. 1991; Hart and Bryant 1997).

The western front of the Diablo Range is defined by the Hayward and Calaveras faults, both of which are active faults of the San Andreas system (Anderson et al. 1982; Wagner et al. 1991; Hart and Bryant 1997). The eastern range front bounding the San Joaquin Valley (i.e., the eastern edge of the Diablo Range) is also defined by faulting.

## Geologic Units

### Santa Cruz Mountains

The Santa Cruz Mountains uplift exposes a wide range of bedrock units in a complexly deformed series of fault slivers. These include a variety of units assigned to the Jura-Cretaceous Franciscan Complex: sandstone, greenstone, serpentinized ultramafic rocks, and small bodies of limestone. Volcanic rocks of Eocene and Miocene age and volcanic strata also of Miocene age are exposed locally. The low foothills along the eastern range front consist of Pleistocene alluvium recording uplift of the range (e.g., Wagner et al. 1991).

Ultramafic rocks are characterized by the occurrence of some form of ferromagnesian silicate mineral and are common throughout the world as local outcrops or large, regional formations. In the Coast Range of California, most ultramafic rocks are of the serpentinite variety. The prevailing view of the origin of Franciscan-associated serpentinites is that they are altered masses derived from the upper mantle and transferred tectonically to the earth's surface (Norris and Webb 1990). Therefore, serpentinite is often associated with southeast-to-northwest trending fault zones, as is the case in the study area. Serpentinite, and the serpentine soils derived from them, are distributed widely in California in the Coast Range from Santa Barbara County to the Oregon border and in the western Sierra Nevada foothills from Tulare to Plumas Counties (Kruckeberg 1984). Serpentine soils are particularly relevant to the ecology of the study area because they support unique species assemblages (see *Serpentine Soils* discussion below).

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critical refuges for fish. Examples included: Upper Silver Creek (Silver Creek Fault), Arroyo Aguague (Calaveras Fault) as a source of flow for Upper Penitencia Creek, Coyote Creek between Coyote and Anderson reservoir (Calaveras Fault) and also downstream of Gilroy Hot Springs (Madrone Fault), San Felipe Creek (Calaveras Fault), Bodfish Creek (Sargent Fault), and Tar Creek (Sargent Fault) (J. Smith pers. comm.).

## Diablo Range

The central portion of the Diablo Range consists of *mélange*—locally including serpentinitic bodies—and metasandstone of the Jura-Cretaceous Franciscan Complex. Outcrops of mafic and ultramafic units (i.e., serpentinite) belonging to the Jurassic Coast Range Ophiolite are also locally present, and are particularly well developed along the active Ortigalita fault in the vicinity of Del Puerto Canyon (Wagner et al. 1991; Evarts et al. 1999).

The western Diablo range front is flanked by complexly faulted exposures of sedimentary strata of Cretaceous through Miocene age. These include deep marine strata assigned to the Great Valley Group, shallow marine strata of the Miocene San Pablo Group, and terrestrial strata of the Miocene Contra Costa Group (Wagner et al. 1991). Quaternary alluvial strata accumulated on essentially modern topography buttress against the range front, and both active (Holocene) alluvium and older Quaternary terrace deposits are present in the larger stream valleys (Wagner et al. 1991).

## Valley Floor

The Santa Clara Valley is filled by as much as 1,950 feet of primarily continental (alluvial) sediment largely accumulated within the last 780,000 years. These deposits are essentially flat-lying (Wentworth et al. 2005).

### 3.2.4 Soils

Because of the geologic, climatic, and topographic diversity of the Santa Clara Valley and neighboring uplands, the study area's soils are also very diverse, and a large number of individual soil units have been mapped in the study area. These have been organized into 20 soil associations consisting of soil units of the same texture and composition. Following is a general overview of soil characteristics in the Santa Clara Valley and adjacent areas, by geographic position (U.S. Soil Conservation Service 1968, except as noted). **Figure 3-3** shows generalized soil type distribution in the study area.

- **Lowland areas influenced by tidal waters.** These typically fine-textured, saline, clay-rich soils are restricted to the north-central portion of the study area, along the Bay margin and as far south as parts of the Mountain View-Sunnyvale area. Plant associations supported by these soils may be limited by soil salinity and/or moisture content.
- **Level, low-lying valley areas.** Soils of the Santa Clara Valley flatlands are typically very deep, fine- to medium-textured, and poorly to somewhat poorly drained under natural conditions. Plant associations on these soils may be limited by soil texture and/or moisture content.
- **Major valley drainageways and lower alluvial fan surfaces.** Most soils formed on the flat alluvial plains along major valley drainages and on gently

to moderately sloping surfaces on the lower portions of alluvial fans are medium-textured, although some are gravelly. They range from moderately well drained to somewhat excessively drained under natural conditions. These soils are considered very good for cultivation.

- **Older alluvial fans and terraces in valley-margin and foothills.** Soils of the study area's older alluvial fans and terraces are texturally diverse. They are typically moderately drained to well drained but are underlain by subsoils that contain abundant clay and thus drain slowly. Plant associations on these soils may be limited by low fertility and/or low moisture content.
- **Upland soils.** Soils of the study area's mountainous uplands are typically shallow and well drained and have developed on site from local bedrock.

## Serpentine Soils

Of particular importance from a conservation perspective are the study area's serpentine soils, which are derived from the serpentinite ultramafic rocks of the region. Serpentine soils are typically very shallow, nutrient-poor (i.e., low levels of nitrogen, potassium, phosphorous, and molybdenum essential for normal plant growth), high in magnesium, and may contain elevated levels of the heavy metals chromium and nickel that are toxic to many plant species (Kruckeberg 1954, 1984). Water availability in serpentine soils may also be limited (Davis et al. 1997). As a result, serpentine soils support limited and highly specialized floras and vegetation associations that often include a high number of endemic (i.e., largely or entirely restricted to serpentine soils) and special-status species (Kruckeberg 1984; Safford et al. 2005).

The occurrence of serpentine soils in Santa Clara County is best predicted by a combination of soil and geology maps. As shown in **Figure 3-4**, the study area supports an estimated 13,180 acres of serpentine soils, 9,194 acres of serpentine bedrock, and 12,636 acres where serpentine soil and bedrock overlap (Brabb and Dibblee 1974; Dibblee 1973, 1977)<sup>4</sup>. As inferred from serpentine soil and geology maps, we estimate a total of 35,010 acres of serpentine soils in the study area. By far the largest occurrence of serpentine in the study area is along the low ridge immediately east of U.S. 101 known as the "Kirby Hills" or "Coyote Ridge" between the Silver Creek Hills and Anderson Reservoir (this document uses the name Coyote Ridge for this feature). Other important outcrops of serpentine soils in the study area occur in or on the following areas:

- the Santa Teresa Hills,
- Communications Hill,
- Tulare Hill,
- the foothills of the Santa Cruz Mountains near Chesbro and Calero Reservoirs,

<sup>4</sup> For the purposes of this Plan, serpentine soils are assumed to occur where serpentine soils and serpentine bedrock are mapped. Each map layer alone is insufficient to fully represent field conditions.

- the foothills adjacent to and west of Anderson Reservoir, and
- the foothills adjacent to and west of Coyote Creek upstream of Anderson Reservoir and Coyote Reservoir.

Serpentine plants occur in small patches outside mapped serpentine soils and geology, possibly due to serpentine alluvial material washing downstream (J. Hillman pers. comm.).

## 3.2.5 Climate and Hydrology

### Climate

Santa Clara County has a Mediterranean climate, characterized by extended periods of precipitation during the winter months and virtually no precipitation from spring through autumn. The wet season generally extends from November through April, while rainfall from May through October tends to be minimal. Annual average rainfall varies significantly due to topography and related orographic and rain shadow effects. Increased elevation on coastal oriented slopes (typically west/southwest facing) results in increased precipitation while descending the lee-side interior facing (typically east/northeast facing) results in decreased precipitation. A rainfall transect across the county illustrates this condition. For example, portions of Santa Clara County in the Santa Cruz Mountains receive 40 to 60 inches per year. Moving east, down the lee side of the Santa Cruz range into the rain shadow of the central Santa Clara Valley, precipitation falls an average of 13 to 14 inches in the vicinity of downtown San José (Santa Clara Basin Watershed Management Initiative 2003); see **Figure 3-5**. Similarly, moving further east and ascending the west facing slopes of the Diablo Range, precipitation increases with elevation to 20–30 inches per year. Further east into the interior valleys and ridgelines of the Diablo Range, precipitation amounts similarly fluctuate with elevation and aspect. In addition to orographic/rain shadow effects, site-specific conditions of elevation and aspect will influence local microclimates and water balance conditions. For example, canyon areas of north facing hillslopes and streams that experience less sunlight and less day-length will have less evapotranspiration, greater ambient soil moisture, and generally more moderate and cooler temperatures due to higher moisture content and greater shade.

The wind patterns in the Santa Clara Valley are influenced greatly by the terrain, resulting in a prevailing flow roughly parallel to the Valley's northwest-southeast axis. A north-northwesterly sea breeze often extends up the Valley during the afternoon and early evening and a light south-southeasterly drainage flow often occurs during the late evening and early morning. In summer a convergence zone is sometimes observed in the southern end of the Santa Clara Valley between Gilroy and Morgan Hill, when air flowing from the Monterey Bay through the Pajaro Gap gets channeled northward into the south end of the Santa Clara Valley and meets with the prevailing north-northwesterlies. Wind speeds are greatest in the spring and summer, and least in the fall and winter. Nighttime

and early morning hours have light winds and are frequently calm year round, while summer afternoon and evenings can be breezy. Strong winds are rare, coming only with occasional winter storms.

The average annual rainfall in San José for the period of record of July 1, 1948 to December 31, 2005 was 14.66 inches (Western Regional Climate Center 2006). Average rainfall figures can be somewhat misleading because, in addition to seasonal variation, droughts in California are not uncommon. For example, annual rainfall in San José between 1948 and 2005 ranged from 6.12 inches in 1953 to 32.57 inches in 1983 (Western Regional Climate Center 2006). Snow may occur in the mountains where the headwaters for the watersheds are located but melts quickly and does not provide flow from snowmelt in the late spring to early summer as occurs in the Sierra Nevada Mountains.

The Mediterranean climate also produces fairly mild air temperatures in the valley floor that rarely drop far below freezing. North of San José, the average summer temperatures are rarely higher than 90°F. South of San José both summer and winter extremes are somewhat greater (Santa Clara Basin Watershed Management Initiative 2003).

## Watershed Hydrology

The major watersheds within the northern portion of the Plan study area are those of the Coyote Creek and Guadalupe River. Portions of the upper Pajaro River Watershed occur in southern Santa Clara County and the study area (see **Figure 3-6**)<sup>5</sup>. Other major drainages that pass through Santa Clara Valley include the Los Gatos Creek, San Tomas Aquino Creek, Saratoga Creek, Calabazas Creek, Stevens Creek and Permanente Creek, all of which originate in the Santa Cruz Mountains. The lower portion of the Guadalupe River watershed is within the study area (**Figure 3-6**). Very small portions of the Calabazas Creek and San Tomas watersheds within San José are also part of the study area (**Figure 3-6**).

While rainfall is the primary source of surface flows in the County, high groundwater tables contribute to the flows of some local streams. Springs are a clear expression of groundwater intercepting the surface. In some areas, springs are an important contributor to perennial flows in local streams. There are 92 springs in the study area mapped by USGS; of these, seven occur on serpentine soils (**Figure 3-6**) and provide important habitat for Mt. Hamilton thistle, which is found primarily in serpentine seeps.

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<sup>5</sup> The Pajaro Watershed in the study area includes the following watershed basins: Pacheco (in part), South Santa Clara Valley (in part), Llagas, Uvas, Pescadero (in part).



## Coyote Creek Watershed

The Coyote Creek Watershed is the largest watershed in Santa Clara County (206,000 acres, or approximately 40% of the study area) and is entirely contained within the County and the study area except for the outflow to the Bay. The headwaters originate on the east side of Santa Clara County in the Diablo Range. The watershed is bounded by Coyote Creek to the west and the Diablo Range to the east. Coyote Creek is the longest creek in the County at approximately 63 miles. It originates in the Diablo Range at approximately 3,000 feet and flows southward then northward towards South San Francisco Bay (Santa Clara Valley Water District 2002a). Between its headwaters and Anderson Dam, Coyote Creek and its tributaries flow through mostly steep canyons or narrow valleys. Downstream of Anderson Dam, Coyote Creek flows through the flat Santa Clara Valley on a historically wide alluvial plain.

Coyote Creek originates in the Diablo Range and enters Coyote Valley at its topographic divide with the Llagas Basin to the south. Coyote Creek flows northwesterly through Coyote Valley and Santa Clara Valley before entering San Francisco Bay at Alviso. The major tributaries entering Coyote Creek include Fisher Creek, Upper Silver Creek, Lower Silver Creek, and Upper Penitencia Creek (Santa Clara Valley Water District 2002a). Flow in Coyote Creek below Anderson Dam is perennial, and in the summer is sustained with seepage and releases from Anderson Dam, groundwater, and urban runoff (Santa Clara Valley Water District 2002a). The creek also tends to be dry in dry years on the valley floor between Hellyer Park and Capitol Expressway (J. Smith pers. comm. 2009; J. Abel pers. comm. 2010). Coyote Creek above Anderson and Coyote Reservoirs is intermittent in several reaches. Many of the creeks draining into Coyote Creek are perennial, but the smaller tributaries on the eastern side of the watershed are dry during the summer and fall (Santa Clara Valley Water District 2002a).

Upper Penitencia Creek is kept artificially perennial through releases from the South Bay Aqueduct and the City of San José's Cherry Flat Reservoir. Arroyo Aguague, a tributary to Upper Penitencia Creek in Alum Rock Park, provides surface flow to the creek even if there are no releases from Cherry Flat Reservoir (J. Smith pers. comm. 2009). Much like the Coyote Creek flow pattern, the perennial flow observed is the result of interim operations applied since the onset of the FAHCE proceedings. Under traditional operations, stream flow terminates at the Maybury diversion. Under interim operations a bypass flow is applied to maintain a hydraulic connection with the lower end of the stream and Coyote Creek. Despite augmented flow, recent summer droughts has resulted dry backs has occurred at Cherry Flat and Arroyo Aguague, upstream of the flow augment put-in point.

Coyote Valley is an extension of the Santa Clara ground-water basin and is commonly referred to as the Coyote Valley ground-water subbasin. The Coyote Narrows divides the Coyote Valley ground-water subbasin from the Santa Clara Valley ground-water basin. Characteristics of the basin and subbasin differ. Groundwater generally moves in a northwesterly direction or down the valley. The groundwater level in Coyote Valley is typically shallow or within 50 feet

below the surface. Groundwater recharge is predominately from percolation of flow in Coyote Creek in the first 5 to 10 miles downstream of Anderson Dam. Coyote Creek is quite responsive to winter rains and subsequent stormwater runoff. Further downstream, subsurface flow is forced to the surface as the valley becomes confined at Coyote Narrows and returns to the shallow subsurface as it enters the Santa Clara groundwater basin. At the divide between the Coyote and Llagas watersheds there is some movement of groundwater from the Coyote watershed to the Llagas watershed.

In the Coyote Watershed, the SCVWD operates two reservoirs—Anderson and Coyote—that regulate flow into Coyote Creek. Anderson Reservoir is the largest reservoir in Santa Clara County, with a capacity of 90,373 acre-feet. The Coyote Reservoir has a capacity of 23,244 acre-feet. The small (<500 acre-feet) Cherry Flat Reservoir, operated by the City of San José, partially regulates the flows of Upper Penitencia Creek. Flows in other creeks are largely dependent on groundwater, springs, raw water turnouts, or piped urban runoff.

Percolation ponds have been maintained by the SCVWD throughout the watershed to actively promote aquifer recharge in order to minimize future subsidence and saltwater intrusion. These ponds of water are held over naturally occurring sandy gravel beds (Santa Clara Basin Watershed Management Initiative 2003). The four main groundwater recharge areas in the Coyote Watershed are the Penitencia, Overfelt, Ford Road, and Coyote ponds. The Penitencia percolation ponds receive water from Upper Penitencia Creek and the South Bay Aqueduct (which, in turn, receive water from the Sacramento–San Joaquin Delta). The Overfelt ponds are also near the lower reaches of Upper Penitencia creek. The Ford Road and Coyote ponds receive water from Coyote Creek, Anderson Reservoir, and the Central Valley Project supplied by the San Felipe Division of the Bureau of Reclamation. Between Anderson Reservoir and the Coyote Narrows, flows into Coyote Creek are an in-stream source of recharge to the Coyote Creek groundwater basin (Santa Clara Valley Water District 2002a). Flows from Upper Penitencia Creek also provide in-stream recharge in the basin.

## **Guadalupe River Watershed**

The Guadalupe River Watershed headwaters originate on the west side of Santa Clara County in the Santa Cruz Mountains and encompass approximately 109,000 acres, 59,000 acres of which (54%) are in the study area. The Guadalupe River discharges to the southern terminus of San Francisco Bay via the Alviso Slough near the community of Alviso (Santa Clara Basin Watershed Management Initiative 2003). The lowermost reach by San Francisco Bay and the uppermost watershed are excluded from the study area.

Tributaries to the Guadalupe River include Los Gatos, Ross, and Canoas Creeks. Los Gatos Creek is the largest tributary to the Guadalupe River and joins the river near downtown San José (Santa Clara Basin Watershed Management Initiative 2003). Reservoirs in the Guadalupe River watershed include Almaden, Guadalupe, and Calero Reservoirs. All three reservoirs are relatively small;

Calero Reservoir has a capacity of 9,934 acre-feet, while Guadalupe and Almaden have capacities of 3,415 and 1,586 acre-feet, respectively. Runoff is captured in the reservoirs in the winter months and stored for use in the summer dry months. Water released from the reservoirs and the SCVWD's Almaden Valley pipeline maintains perennial stream habitat downstream on Guadalupe Creek to the Los Capitancillos percolation ponds and Guadalupe River. Lexington and Vasona Reservoirs regulate flows in Los Gatos Creek. Vasona Reservoir is the smallest maintained by SCVWD, at 400 acre-feet. Lexington Reservoir is not included in the Plan study area. Releases are made from Lexington Reservoir during summer for groundwater recharge, and flows are percolated into the groundwater upstream of the confluence with the Guadalupe River (Jones & Stokes 2002).

Nine percolation pond facilities are located in the Guadalupe Watershed. Each of the facilities has multiple ponds. Six of the nine percolation pond facilities are charged from Los Gatos Creek, with the rest charged from the Guadalupe River or Guadalupe Creek (Santa Clara Valley Water District 2002b).

## **Pajaro River Watershed**

The Pajaro River is the largest coastal stream between San Francisco Bay and the Salinas Watershed in Monterey County (RMC 2005). Approximately 11.7 miles of the upper Pajaro River fall within the Plan study area in southern Santa Clara County. The Pajaro River eventually enters the Pacific Ocean at Monterey Bay. Pacheco, Uvas, Llagas, and Pescadero Creeks are the primary tributaries to the Pajaro River in the study area and cover an approximately 230,000 acre region. The creeks in this watershed are the only ones in Santa Clara County that flow southward for their entire length (Santa Clara Valley Water District 2002c). All of the Llagas Watershed (65,365 acre) and all of the Uvas Watershed (55,916 acres) are within the study area. Most of the Pacheco Watershed (100,742 acre) and a small portion of the Santa Cruz Mountains Watershed (i.e., the watershed of Pescadero Creek) are also included in the study area (7,269 acres).

Channels in the Llagas Creek watershed have been modified substantially to convey flood flows. Some channels are natural, while others in the urban areas of Morgan Hill, San Martin, and Gilroy are highly modified and largely unvegetated (U.S. Department of Agriculture 1982). Between U.S. 101 to Santa Theresa Blvd, portions of Uvas Creek have also been modified with levees and armoring to convey flood flows (J. Abel pers. comm. 2010). In addition, extensive quarry operations from the 1940s to 1960s in the Christmas Hill Park area have affected channel morphology of Uvas Creek (J. Abel pers. comm. 2010). Pacheco Creek remain largely unmodified by flood control projects.

There are three reservoirs in the Pajaro Watershed within the study area: Uvas and Chesbro, owned by SCVWD, and the Pacheco Reservoir, owned by the private Pacheco Pass Water District. Uvas Reservoir impounds water along Uvas Creek and has a capacity of 9,835 acre-feet. Chesbro Reservoir occurs along Llagas Creek and has a capacity of 7,945 acre-feet. SCVWD maintains

percolation ponds below Chesbro Dam along Llagas Creek (U.S. Department of Agriculture 1982).

Soap Lake is a natural floodplain basin, approximately 9,000 acres in size, on the Pajaro River, divided between Santa Clara and San Benito Counties at the southern edge of the Santa Clara Valley and the northern edge of the Bolsa Valley. During significant rain events, Soap Lake is a floodplain that acts as a retention basin, capturing flows from Pacheco Creek and Tequisquita Slough. The lake discharges primarily to Miller Canal, which discharges to the Pajaro River near the mouth of Llagas Creek; at high flows a portion of the discharge flows to the old upper Pajaro River, which was bypassed by Miller Canal. During moderate floods, Soap Lake may extend just beyond San Felipe Lake in San Benito County. During 100-year events, Soap Lake may expand to several thousand acres, encompassing the lower reaches of Llagas Creek and Uvas Creek (RMC 2005). A recent study has determined that Soap Lake is vital to reduce flooding risk in the lower Pajaro River in Monterey County and within the cities of Castroville and Watsonville (RMC 2005).

## Hydrologic Modifications

Due to urbanization and water-supply projects throughout the County, the natural hydrology of many streams and watersheds has been altered. Modification of natural flow patterns is the result of water storage and release from reservoirs and percolation ponds, increased runoff, channel modification, groundwater withdrawal, land subsidence, hydraulic structure placement, vegetation clearing, and urban development. The resulting stream hydrograph reduces peak winter flows and provides additional water during drier summer months. This alteration of the hydrograph is clearly evident in Coyote Creek. **Figure 3-7** shows mean monthly streamflow in Coyote Creek before and after the construction of Anderson Dam. In the winter, Anderson Reservoir captures rainfall and releases winter flows that are reduced and less variable from the historic condition. During the dry season, reservoirs also release water in order to maintain flows during the summer months, increasing flows compared to historic conditions. The net result has been a “flattening” of the hydrograph and reduction in the historic seasonal variations in flows. Increased summer flows and restrictions on channel meandering has also increased the density of riparian vegetation (Grossinger et al. 2006), altering ecosystem function.

Runoff from streams and surrounding areas becomes less attenuated (i.e., flashier) as the density of urban development increases. Replacement of natural vegetation with impermeable urban surfaces such as asphalt, concrete, and roofs; and highly efficient drainage systems increases the volume of runoff and the peak flow rate for frequent events (Santa Clara Valley Water District 2001). The decreased infiltration and increased runoff associated with urbanization can cause the size of peak floods to increase (County of Santa Clara Planning Department 1969).

Flooding due to increased runoff has changed historical stream morphology and flow patterns in the watersheds. While some of the stream channels in the upland

areas are still natural, most of the tributaries within the valley floor area of the watershed have been significantly modified to optimize flood conveyance. Many types of channels have been constructed for controlling high flows, including earthen levees, trapezoidal concrete channels, floodwalls and culverts (Jones & Stokes 2000). Design and operation of flood-conveyance elements were historically focused on conveying 100-year storm flows and to accommodate new development adjacent to these stream corridors (Santa Clara Valley Water District 2002a).

Channelization projects designed to increase hydraulic capacity often expanded channel dimensions and straightened channel meanders. The construction of channels to unnatural dimensions leads to increased sediment deposition as the stream attempts to re-create smaller, equilibrium dimensions. For example, the lower reaches of Coyote Creek and the Guadalupe River have been channelized and the streams are now contained between several miles of earthen levees.

Intensive withdrawal of groundwater from the alluvial aquifers in the San José area between the early 1900s and mid-1960s caused a decline in groundwater levels and resulted in substantial land subsidence. For example, 12.7 feet of subsidence was measured in San José from 1916 to 1969 (Poland 1969; Poland and Ireland 1988). Subsidence was one important factor that led to increased flooding in the northern Santa Clara Valley in the twentieth century. Since 1967, recovery of the water table has been substantial because of increases in imported water by SCVWD, the use of percolation ponds and river systems to recharge the aquifer (in part with this imported water), and favorable local-water supply resulting in decreased withdrawal and increased recharge.

Percolation ponds provide holding areas where water slowly recharges groundwater to primarily offset pumping that exceeds the natural recharge. Percolation ponds also compensate for the reduced rates of infiltration from urban development and other impermeable land uses. The SCVWD releases locally conserved and imported water to 71 off-stream percolation ponds that range in size from less than 1 acre to more than 20 acres. Through local streams and percolation ponds, the SCVWD recharges the groundwater basin with about 157,000 acre-feet of water each year (Santa Clara Valley Water District 2002b). Groundwater recharge keeps some streams flowing year round, when under natural conditions, the streams would be dry during the summer into the early fall. Very little published information exists to present a current groundwater budget detailing inflows and outflows for the Santa Clara Valley basin (California Department of Water Resources 2004).

## 3.3 Ecosystems, Natural Communities, and Land Cover

### 3.3.1 Definitions

The following definitions are provided to clarify terms used in the NCCP Act. These terms are also found in the glossary (**Appendix A**).

### Ecosystem Functions and Services

In order for this Plan to be approved, the NCCP Act requires CDFG to make findings that this Plan conserves, restores, and manages representative natural and seminatural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem function, and biological diversity (California Fish and Game Code Section 2820(a)(4)(A)). For the purposes of this Plan, *ecosystem function* is defined as processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients that maintain the characteristics and biodiversity of an area (Mooney et al. 1995). Ecosystem functions include such biological and physical processes as hydrological regulation, dispersal, predation, herbivory, pollination, decomposition, nutrient cycling, soil disturbance, and energy fluctuations.

The general ecological concept of ecosystem function as it applies to conservation has evolved in the last two decades to focus on the subset called ecosystem services<sup>6</sup>, and a shift in management strategy from protection of reserves to sustainability and stewardship of the human-occupied landscape (Daily and Matson 2008; Cowling et al. 2008). Ecosystem services include maintenance of habitat for endangered species as well as production of clean water and air, aesthetics for tourism, forage for livestock, and climate stabilization. They have human economic value that can generate payments as incentives to maintain those services. This newer concept recognizes the vital roles of people, including planners, managers, and consumers, in a vision of conservation for California rangelands (Daily 2011).

### Biological Diversity

The NCCP Act calls for the protection of species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the area (California Fish and Game Code Section 2820(a)(3)). The NCCP Act also calls

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<sup>6</sup> Jack et al (2008) defines ecosystem services as the benefits that people derive from ecosystems, including commodities and regulating, supporting, and cultural services.

for maintaining biological diversity through conservation, restoration, and management of natural and seminatural landscapes.

*Biological diversity* or *biodiversity* is defined in this Plan as the variety of organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families, and higher taxonomic levels (Lincoln et al. 1998).

## Ecological Integrity

The NCCP Act calls for sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the study area (California Fish and Game Code Section 2820(a)(4)(E)). The NCCP Act also calls for maintaining the ecological integrity of large habitat blocks through conservation, restoration, and management of natural and seminatural landscapes.

Ecosystems have *ecological integrity* when their native components are intact, including abiotic components, biodiversity, and ecosystem processes. This Plan seeks to support the goal of ecological integrity by protecting large blocks of habitat such that the various components of functioning ecosystems are maintained in an interconnected area.

## Environmental Gradients

The NCCP Act calls for incorporating a range of environmental gradients such as slope, elevation, aspect, and coastal or inland characteristics to provide for shifting species distributions due to changed circumstances (California Fish and Game Code Section 2820(a)(4)(D)).

This Plan defines *environmental gradient* as a shift in physical and ecological parameters across a landscape, such as changes in topography, climate, geology, land cover types, and natural communities.

## Natural Communities

*Natural communities* are a collection of species that co-occur in the same habitat or area and interact through trophic and spatial relationships. Communities are typically characterized by reference to one or more dominant species (Lincoln et al. 1998). The NCCP Act calls for the protection of natural communities on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the area (California Fish and Game Code Section 2820(a)(3)). In the Santa Clara Valley Habitat Plan study area, seven natural communities and two additional land cover

types (irrigated agriculture and developed) are defined that will be discussed further in the chapter.

The term *rangeland* is used in this Plan to refer to the collection of multiple natural communities on which the indigenous vegetation is predominantly grasses, grass-like plants, forbs or shrubs that are grazed or have the potential to be grazed, and which is used as a natural ecosystem for the production of grazing livestock and wildlife. Rangelands include natural grasslands, savannas, shrublands, many deserts, steppes, tundras, alpine communities and marshes (Allen et al. 2011). Rangelands usually occur in areas not suitable for cultivation, irrigation, residential development, industrial development, or timber production. The rangelands within the study area occur primarily in grassland land-cover types but also include oak woodlands, riparian forest, and seasonal wetlands. Rangelands in the study area are considered “working rangelands” because numerous economic activities (including livestock grazing) take place there.

## 3.3.2 Methods

### Data Collection

Sources used to map and describe the physical setting of the study area are listed below.

- U.S. Geological Survey data on topography and hydrology.
- Geologic maps of the area (Wagner et al. 1991; Helley et al. 1994).
- Geologic map, Santa Clara County, California. California Division of Mines and Geology, scale 1:62,500 (Brabb and Dibblee 1974).
- Preliminary map of Santa Clara Valley serpentines [soils] (unpublished), scale 1:50,000 (Dibblee 1973, 1977).
- Preliminary geologic map of the Mt. Madonna quadrangle, Santa Clara and Santa Cruz Counties, California. U.S. Geological Survey Open-File Report [OF-73-59], scale 1:24,000 (Dibblee 1973).
- Soil survey information (U.S. Soil Conservation Service 1968).
- Other published information (Hickman 1993; Alt and Hyndman 2000; Santa Clara Valley Water District 2006).
- Springs and rainfall data from USGS (California Spatial Information Library 1997).
- Watershed data from California Interagency Watershed Map (CalWater version 2.2.1) (California Interagency Watershed Mapping Committee 1999).

Topography, hydrology, and soil data were downloaded from agency websites and imported into ArcInfo, where files were clipped and converted into the projection for the study area.



## Land Cover Mapping

One of the primary data sources for this Plan is a detailed geographic information systems (GIS)-based map of land cover types within the study area. A *land cover type* is defined as the dominant character of the land surface discernible from aerial photographs, as determined by vegetation, water, or human uses. Land cover types are the most widely used units in analyzing ecosystem function, habitat diversity, natural communities, wetlands and streams, and covered species habitat. Data sources, mapping standards, and the classification and interpretation of land cover types are discussed below.

### Data Sources

The following are the primary sources of information for the land cover mapping in the study area.

- True-color aerial photographs (resolution of 2 feet<sup>7</sup>) flown in December 2003 (acquired from AirPhoto USA).
- True-color aerial photographs for non-urban portion of the study area (resolution of 9 inches) flown in March 2001 (provided by Santa Clara Water District).
- Serpentine soils and serpentine geology digitized from the map sources listed above.

The ancillary data sources listed below were used to obtain information not available in the primary sources and to check the mapped information for accuracy.

- True-color aerial photographs (resolution 1.5 foot) flown in December 2005 (acquired from AirPhoto USA)<sup>8</sup>.
- National Wetlands Inventory Maps (scale 1:65,000) from the U.S. Fish and Wildlife Service for a portion of the study area based on color-infrared photographs taken in 1982–1987.
- Streams (Produced by SCVWD in 2006–2007; see discussion below).
- Local roads (Santa Clara County data set).
- Coyote Valley Specific Plan vegetation data developed from site visits (City of San José 2004).
- Soil survey mapping (U.S. Soil Conservation Service 1968).
- Historical locations of valley oak; GIS layer digitized from the 1:62,500 Wieslander Vegetation Type Map, a dataset of photos, species inventories, and plot maps compiled in the 1920s and 1930s (California Department of Forestry and Fire Protection 1992).

<sup>7</sup> Each cell represents an area on the ground of approximately 2 feet by 2 feet, or 4 square feet.

<sup>8</sup> December 2005 air photos were not made available until March 2006. These photos could not be used as the primary air photo source because the land-cover mapping process started in November 2005.

- Vegetation maps of open space preserves adjacent to the western portion of the study area developed from air photo interpretation (Midpeninsula Regional Open Space District 2006).
- Vegetation map of the Coyote Creek Parkway County Park developed from remote sensing (County of Santa Clara Parks and Recreation Department 2004a).
- Land cover map for the San Francisco Public Utilities Commission's Alameda Watershed lands in Santa Clara and Alameda Counties (adjacent to the northern edge of the study area) developed from air photo interpretation (Jones & Stokes 2005).
- Current land cover maps for large projects in the study area:
  - The Castro Valley Ranch EIR, an approximately 8,500-acre site in the southwest corner of the study area, developed from site visits (H.T. Harvey & Associates 2006).
  - Mapping of freshwater and seasonal wetlands in Coyote Valley (City of San José 2007).
  - Land cover mapping of the proposed Lucky-Day Wildlife Conservation and Wetland Mitigation Bank (WRA Environmental Consultants 2008), north of Gilroy.
  - Land cover and habitat mapping for Young Ranch on Coyote Ridge (WRA Environmental Consultants 2012).
- Historical tideline data from Coyote Creek Historic Ecology Report (Grossinger et al. 2006) and historical land cover data from the study area (Grossinger et al. 2006; San Francisco Estuary Institute 2008).

In addition to using existing data sets, ICF biologists conducted field visits in accessible portions of the study area to develop and verify land cover mapping. An initial field visit was conducted on December 15, 2005 to develop the land cover classification and to perform preliminary verification of aerial photograph signatures. Other field visits were conducted on April 20–21, May 3–5, May 11–12, and May 24–25, 2006 to verify land cover types and consistency of mapping, and to collect additional data for land cover type descriptions. Initial mapping was verified by visual inspection from locations accessible by public roads and roads on state-owned and private lands for which access permission had been obtained. Areas were selected for field verification on the basis of the land cover types present and accessibility.

Access was difficult in many parts of the study area due to extensive private lands and few public roads. Access in the western portion of the study area was sufficient to verify the different land cover types that occurred there. Access in the central eastern portion of the study area was more limited, but also allowed most land cover types to be visited. Access to the extreme northeast, east, and area south of SR 152 was not possible due to extensive private holdings and lack of approvals for access. There were no unique land cover types in these areas so we believe that this lack of access did not compromise the land cover mapping.

Once field visits were conducted, land cover mapping was revised on the basis of field findings.

## Land Cover Type Classification

A classification system for land cover types was developed for the study area based primarily on the widely used classification system of the CDFG (California Department of Fish and Game 2003a, 2007), which in turn is based on the vegetation classification system developed for the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995). Additional input was obtained from the sources listed below.

- Holland (1986) and Mayer and Laudenslayer (1988, 1999).
- Current regional and local mapping projects such as Coyote Ridge (California Native Plant Society 2003), Sierra Azul Open Space Preserve (Midpeninsula Regional Open Space District 2006), and the land cover map for the San Francisco Public Utilities Commission's Alameda Watershed lands in Santa Clara and Alameda Counties, adjacent to the study area (Jones & Stokes 2005).
- Field visits by ICF senior biologists.

The proposed system (**Table 3-1**) has been adapted to incorporate classification systems used by the Local Partners with input from vegetation and wildlife specialists familiar with the study area. The land cover classification was developed with the criteria listed below.

- Each land cover type must be distinguishable on the digital aerial photography based on a unique and consistent signature, or with the use of ancillary data such as soil types or geologic substrate.
- Each land cover type should be useful to the Plan in terms of defining the location and extent of an important vegetation type, habitat for covered species, or a distinct type of development.
- The land cover type classification should be compatible with existing local, regional, and national land cover classification schemes when possible.

A list of land cover types is given in **Table 3-1**. A comparison ("cross-walk") between land cover types and common vegetation classification systems is presented in **Table 3-2**.

## Mapping Procedures

ArcGIS 9.0 software was used to create a GIS dataset of land cover types. The land cover classification also defined the minimum mapping unit that was used for each land cover type. *Minimum mapping units* are the smallest area mapped for each type. Minimum mapping units range from 0.25 acre for wetland and riparian land cover types to 10 acres for most other land cover types. This range

of minimum mapping units is sufficient for regional conservation planning and balances the need for high resolution (lower minimum mapping unit) with schedule and budget limitations (higher minimum mapping unit). Minimum mapping units are also limited by the resolution of the imagery and the distinctiveness of the land cover signature relative to adjacent land cover.

A 10-acre minimum mapping unit was used for all land cover types, except for the land cover types noted below.

- Serpentine bunchgrass grassland and mixed serpentine chaparral, which were mapped at a 1-acre minimum mapping unit.
- All riparian, wetland, and aquatic types, which were mapped at a 0.25-acre minimum mapping unit.
- Serpentine seeps and rock outcrops, which had no minimum mapping unit (but due to air photo resolution had a likely minimum mapping unit of 0.1–0.25 acres).

The mapping process involved digitizing polygons on screen (a process known as “*head-up digitizing*”) from the primary aerial photographs described above, followed by field verification and a formal accuracy assessment.

Polygons were digitized for areas with distinct image signatures that met minimum mapping unit requirements. Digitizing was completed on-screen by botanists familiar with the study area, and well trained and experienced with this mapping procedure from other HCPs and NCCPs in northern California. Digitizing was conducted while viewing the aerial imagery at mapping scales of 1:4,800 to 1:6,000. The botanists were provided with grids of 0.25 acre and 10 acres to assist in maintaining the minimum mapping units during digitization. Once digitized, polygons were assigned to land cover types on the basis of the criteria in the land cover type definitions (described below under each land cover type).

During the mapping process, polygons with uncertain land cover types were flagged for future field verification. Once the mapping was complete, the botanists verified these ambiguous polygons in the field where access was available.

Serpentine bunchgrass grassland and serpentine chaparral were mapped based on the intersection of annual grassland and chaparral, respectively, with the serpentine soils and geology layers (**Figure 3-4**), and verified in the field where possible. Some areas along Coyote Ridge that were mapped as having serpentine soils or geology were excluded from the serpentine bunchgrass grassland or serpentine chaparral land cover layers because of a lack of field evidence of these plant communities (S. Weiss pers. comm.). Serpentine bunchgrass grassland mapping was refined based on site specific mapping when available (e.g., WRA Environmental Consultants 2009). Boundaries of aquatic features (ponds, reservoirs) were digitized based on the March 2001 photograph when water levels were higher than in the December 2003 image. Recent urban and

agricultural development was updated based on the December 2005 aerial photography.

Ancillary information was used to supplement the land cover information acquired by aerial photograph interpretation. National Wetlands Inventory maps were used to check and augment the wetlands mapping, especially for isolated ponds and seasonal wetlands. Data from SCVWD were used as the stream layer for the area. In 2006–2007, SCVWD staff digitized all stream reaches in the study area using USGS Digital Elevation Models (DEM) overlaying color orthophotos. Mapped signatures for specific land cover types were also compared with vegetation maps of the Sierra Azul Open Space Preserve (Midpeninsula Regional Open Space District 2006) to verify the accuracy of the current mapping effort.

## Accuracy Assessment

A formal accuracy assessment could not be conducted for all land cover types due to the inaccessibility of large areas of the study area. However, a field accuracy assessment was performed for all land cover types on the Santa Clara Valley floor to quantify the reliability of the mapping. For land cover types with fewer than 30 polygons, all accessible polygons were field verified. For land cover types with more than 30 polygons, a random sample of 30–40 polygons was selected and verified if accessible. A total of 306 polygons were field verified during this accuracy assessment. Field verification was conducted by two staff, including one botanist. Field verification was performed by visual observation of land cover units from publicly-accessible roads using binoculars and views from vantage points where possible.

A polygon was classified in one of three ways. The first classification was “no change”, meaning the polygon was mapped correctly. The second classification was “error”, indicating a misinterpretation from the aerial imagery. The third classification was “change,” indicating a land use change that occurred after the aerial photographs were taken. The resulting map accuracy for the Valley floor was 73% when calculated by number of polygons. The map accuracy for the Valley floor was 89% when calculated by polygon area (31,258 acres were checked)<sup>9</sup>. All errors identified were corrected in the final land cover map.

**Table 3-3a** indicates the results of the accuracy assessment of the land cover mapping in the Valley floor by polygon. **Table 3-3b** provides the same results by acreage of land cover type.

Land cover types outside the Valley floor were spot checked throughout the rest of study area in a series of field visits from public roads. Based on the accuracy assessment and these site visits, a qualitative estimate of overall confidence in the mapping of all land cover types is presented in **Table 3-4**. Factors that were considered in this subjective estimate included:

<sup>9</sup> The error rate for urban and agricultural land-cover types may not be a good indication of the error rate for natural land-cover types due to the substantial differences in polygon size, complexity, and patterns of air photo signatures.

- the quantitative results of the accuracy assessment,
- the ability of field crews to visit a representative sample of polygons and verify land cover signatures and mapping units, and
- the distinctiveness of the air photo signature during the season of the photo flight.

## Fish Habitat Assemblage Data

A map was developed of native and nonnative fish assemblages and aquatic habitat types throughout the major stream systems in the study area to characterize these important stream communities. Data was first developed to support SCVWD's Stream Maintenance Program. Dr. Jerry Smith of San José State University updated the map in July 2006 for the Science Advisors report of the Habitat Plan to reflect barrier removal and sampling results that occurred in the intervening years since the original map was created (Spencer et al. 2006). The map was then further revised and updated in 2007 by Dr. Smith and Jae Abel, a senior fisheries biologist at SCVWD. Jae Abel then adapted the map so that it corresponded to the new GIS stream data layer developed for the study area by SCVWD in early 2007. Ten categories were defined of fish assemblages and aquatic habitat types. These habitat categories and the fish assemblage map are described in **Appendix L**. The data presented in the appendix are to support the descriptions of natural communities in the study area. These data will not be updated as part of Plan implementation.

### 3.3.3 Covered Species

#### Ecology and Distribution

Detailed *species accounts* of each of the 19 covered species (**Table 1-2**) are provided in **Appendix D**. These accounts summarize ecological information, distribution, status, threats, population trends, and conservation and management activities in the study area. The accounts represent the best available scientific data for each species on which to base this Plan. The species accounts are not intended to summarize all biological information known about a species. Rather, each account summarizes scientific information that is relevant to this Plan. Each account is designed for easy reference; all literature cited within the account is provided within it. The biological data in these accounts form the basis for the impact analysis (Chapter 4) and conservation strategy (Chapter 5) in this Plan.

Land cover types are the basic unit of evaluation for habitat modeling, analyzing potential impacts, and developing conservation strategies for covered species. Most covered species are associated with one or more land cover types (**Table 3-5** for wildlife, **Table 3-6** for plants). These land cover type associations, plus other habitat features, were used to develop habitat distribution models for 15 of the 18 covered species that provide additional information on species impacts and conservation needs.

## Habitat Distribution Models

Habitat distribution models were developed for select covered species to predict where within the study area covered species occur or could occur based on known habitat requirements. These models have been used to assist in quantifying impacts of covered activities on covered species and to assist in developing the conservation strategy<sup>10</sup>. Alternative reserve and restoration designs were evaluated against each covered species model, when available, to help ensure that regulatory standards and biological goals for these species will be met and that conservation for each species is maximized. Habitat distribution models for 15 of the covered species are described in detail in the respective species account (**Appendix D**). Methods used for all models are described below.

Because of model limitations (see *Model Limitations* discussion below), models could not be developed for three of the 18 covered species. For some species, the number of known occurrences within the study area was so low that habitat potential could not be modeled with confidence (e.g., Tiburon Indian paintbrush). Some plant species have very specialized habitat requirements that could not be modeled given the available data (e.g., coyote ceanothus, Santa Clara Valley dudleya). For species without models, development of the conservation strategy ultimately took a more conservative approach than for species with models. For example, field surveys were required more often in suitable habitat for species without models than for species with models. Information in the species accounts was adequate to develop the impact analysis and conservation measures for the species without habitat models.

The habitat map for Bay checkerspot butterfly, a covered species, was developed based on extensive field surveys. This map is described in more detail in the species account and should be considered as a habitat map rather than a predicted habitat distribution.

## Model Structure and Development Methodology

The 15 habitat models described in the species accounts were designed to estimate the extent and location of key habitat characteristics of each species and to be repeatable and scientifically defensible, while remaining as simple as possible. The models are spatially-explicit, GIS-based “expert opinion models” based on identification of land cover types that provide important habitat for these species (**Table 3-5**). Land cover types were identified as suitable habitat based on the known or presumed habitat requirements and use patterns of each species. When supported by appropriate data, the models also incorporate physical parameters including

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<sup>10</sup> Habitat distribution models have been developed on a regional scale using regional data. The models are intended for use in regional planning and do not necessarily provide accurate site-specific species information. For project planning, model results must always be field-verified.

- elevation limits using an absolute limit when data supported a clear limit, or one or more of seven elevation categories (0–500, 500–1000, 1001–1500, 1501–2000, 2001–2500, 2501–3000, 3001–3500 feet msl) when data were insufficient to determine an absolute limit,
- soil type based on eight broad categories (clay, loam, silt, sand, coarse sand, rock, other, unknown [U.S. Soil Conservation Service 1968]),
- presence or absence of serpentine soils and/or serpentine geology (Dibblee 1973, 1977; Brabb and Dibblee 1974)
- slope steepness based on three categories (flat 0–10%, moderate 11–25%, steep >25%), and
- ecoregion subsection (U.S. Forest Service 1997; see **Figure 3-8**).

Further, in some cases, perimeter zones that were used to designate habitat are defined by a certain distance from a land cover type. For example, the California red-legged frog model uses upland habitat for aestivation (summer hibernation) and dispersal, but the probability of use decreases with increasing distance from suitable breeding sites (e.g., ponds, streams).

Primary and secondary habitats for wildlife were designated according to type of habitat use. Land cover types used for breeding were designated as primary habitat. Secondary habitat includes other important habitats used for foraging, aestivation, migration, movement, or dispersal. This secondary habitat is no less important for the species than primary habitat but merely characterizes different habitat function for the species.

Determinations of suitable land cover types and additional physical parameters were based on available data from peer-reviewed scientific literature, survey reports, and environmental documents. Local survey data were used whenever possible to define model parameters. When data were inconclusive or contradictory, conservative values were assumed in estimating suitable habitat. See below for a discussion of the model limitations.

## Covered Species Locations

Documented occurrences of covered species within the study area were used to validate and refine the models. Sources of occurrence data are listed below.

- California Natural Diversity Database (2008 and 2012 data).
- Plant occurrence records from 2004 SCVWD surveys of their facilities (J. Hillman pers. comm.).
- A 1999 survey of foothill yellow-legged frog in Santa Clara County (H.T. Harvey & Associates 1999).
- Least Bell's vireo survey data from SCVWD (Santa Clara Valley Water District 2002d, 2003, 2004).



- Rare plant and special-status wildlife survey data from field work conducted in 2005-2006 east of San José on an approximately 8,000-acre property owned by United Technologies Corporation (UTC) (T. Marker pers. comm.).
- Recent plant occurrence records from the California Native Plant Society (K. Bryant pers. comm., 2006–2007 data).
- Bay checkerspot butterfly survey data from field work conducted between 2009 and 2011 on the 2,150-acre Young Ranch site (WRA Environmental Consultants 2012).

Occurrences that fell outside a model's predicted habitat distribution were evaluated to determine whether they indicated flaws in the model or were anomalous or erroneous points. Erroneous points were deleted; anomalous points were retained but were not used to verify model results. The aerial photographs were examined to assess the significance of extreme outliers.

The majority of the records come from the CNDDDB (California Natural Diversity Database 2008, 2012). Occurrences that have been documented since 1980 were assumed to be extant unless they were on sites that have obviously been converted to other land uses. These recent occurrences were used to verify habitat models. These occurrences are displayed as either *precise locations* or *general locations*, described in more detail in *Occurrence Data Precision* below. Any occurrence before 1980 is considered a *historical location*<sup>11</sup> and is not shown on the habitat model, with a few exceptions. Historical occurrences were considered if the land use at the location has clearly not changed since the sighting (e.g., a state park). Historical occurrences presumed extant were also used to supplement models with few recent occurrence records.

## CNDDDB Data Limitations

CNDDDB records represent the best available statewide data but are limited in their use for conservation planning. CNDDDB records rely on field biologists to voluntarily submit information on the results of surveys and monitoring. As a result, the database is biased geographically toward areas where surveys have been conducted or survey efforts are greater (many areas have not been surveyed at all and this is not reflected in the database). The database may also be biased toward species that receive more survey effort. For example, there have been more surveys for California red-legged frog than other special-status wildlife because it is a listed species. Conspicuous diurnal species such as raptors likely receive greater survey effort than nocturnal species such as bats. Plants typically receive less survey effort than wildlife.

<sup>11</sup> The year 1980 was selected as a somewhat arbitrary cutoff date. We assume that before this year occurrence records are more likely to be inaccurate or no longer present than occurrence records after this year. 1980 is also the cutoff date used by The Nature Conservancy in their internal ecoregional planning process in California.

## Occurrence Data Precision

Data that are reported to the CNDDDB are done so with varied precision. Some occurrences are very well documented with explicit locations (e.g., GPS coordinates) while others are reported with more general location information. CNDDDB staff qualitatively categorize each occurrence record into one of two categories: *specific* and *non-specific* (California Natural Diversity Database 2008).

A *specific* occurrence has sufficient information to be located on a standard USGS 7.5-minute quadrangle map. This information may be based on political or natural features but has been very well described by the observer. These occurrences are mapped by CNDDDB as points with an 80-meter radius or as specific polygons when information allows. For the purposes of this Plan these occurrences are mapped as points and are labeled as *precise location* on the habitat distribution models.

A *non-specific* occurrence is a species occurrence that has been documented by the observer in very general terms. Sometimes the precise location is unclear or lacks critical information that does not allow it to be mapped accurately. These occurrences are mapped by CNDDDB as circular features with a radius of 0.1, 0.2, 0.4, 0.6, 0.8, or 1.0 mile. These occurrences can also be mapped with non-specific polygons, such as the boundary of a park where an occurrence is known to occur. For the purposes of this Plan these occurrences are mapped as points and are labeled as *general location* on the habitat distribution models.

## Model Uses and Limitations

The habitat distribution models are intended to be used only for planning purposes at the scale of the study area. The precision of the habitat distribution models is limited by several factors, including the 10-acre/0.25-acre minimum mapping units used to map each land cover type. Areas of suitable habitat smaller than the mapping thresholds were not mapped and could therefore not be incorporated into the models. This constraint limited the degree of resolution of some habitat features potentially important to some species. Therefore, these models should only be used at the regional scale (i.e., scale of the study area) rather than for site-specific planning. In addition, these models are not intended to be used for project-level CEQA analysis, including determinations on the level of CEQA compliance required (e.g., whether a Categorical Exemption is warranted).

The habitat distribution models were limited to distinguishing habitat uses based on key life history requirements such as breeding, foraging, or dispersal that are tied to land cover types. The data do not allow for further distinctions of habitat quality on a regional scale. To account for these limitations, conservative estimates of habitat parameters were used. This approach tends to overestimate the actual extent of suitable or required habitat for this species, but is consistent with current conservation planning practices when data are limited (Noss et al. 1997).

For the most part, the models are used in this plan to denote suitable habitat. Suitable habitat was assumed to be occupied for the purposes of the take analysis and conservation strategy. This approach is justified because of the limitations in occurrence data described above and the infeasibility of determining presence or absence on such a large scale. To conclusively determine absence, the Wildlife Agencies typically require extensive protocol-level surveys in the field, sometimes spanning several years.

## Alternative Approaches to Habitat Modeling

In developing the habitat distribution models, we considered other potential approaches. For example, the Science Advisors recommended that statistical modeling techniques be considered for determining species habitat relationships within the study area. Because the study area does not include any data on locations where species are absent, statistical modeling would have to be done with “presence-only models” (Hirzel et al. 2002; Hirzel and Arlettaz 2003; Guisan and Thuiller 2005; Elith et al. 2006; Guisan et al. 2006; Pearce and Boyce 2006). Presence-only models use species presence data to draw inferences about a species’ habitat preference. These models characterize the locations where the species were sighted, calculate habitat scores from those locations, and then compare them to habitat distributions within the entire area of interest. To eliminate the need for absence data, these models either assume that locations without sightings are “pseudo-absences” or that there is something different between sighting locations and all the other locations in the area of interest. After reviewing the data requirements and limitations of these models, we determined that it is not feasible to use them in this HCP/NCCP for the reasons outlined below.

The primary reason we were unable to use these techniques is a lack of available data for the covered species, particularly for species whose habitat requirements in the study area are poorly known and where this technique would be most helpful. For example, the specific habitat needs of San Joaquin kit fox are poorly known in the study area but there are only two observations of this species in the County. Presence-only models typically require at least 50 observations to produce robust results. The only covered species with 50 or more observations in the study area are the California red-legged frog, California tiger salamander, Western burrowing owl, and Western pond turtle. These species have relatively well-understood habitat/occurrence relationships, where an expert opinion model tends to work well. The remaining covered species have approximately 30 or fewer observations in the study, making them inappropriate for presence-only models. We investigated the use of museum records to supplement our occurrence data, but most of the online catalogs did not have recent records for our target species or collectors did not record enough information on habitat associations on the collection records to be useful for a presence-only model. Additional field data collection was also not feasible because of the large scale of the study area and schedule and budget limitations.

We also chose not to use presence only techniques because they are sensitive to the selection of the proper spatial extent and model cell size. The spatial extent

of the model should represent the area sampled (Hirzel et al. 2002; Pearce and Boyce 2006). Because CNDDDB and our other biological occurrence data do not provide information of the area surveyed it would be difficult to define the spatial limits of the model. Without this information the model results would be biased and may give more of an indication of sampling effort rather than actual habitat value (Pearce and Boyce 2006)<sup>12</sup>. For example, if most of the surveys were conducted along roadsides than the spatial extent of the model should only include habitats near roadsides. As a result, the available biological occurrences do not provide enough information to adequately assess what would be an appropriate spatial extent of the model.

These techniques are also sensitive to the type and number of pseudo-absence sites chosen for the analysis (Pearce and Boyce 2006; A. Gelfand pers. comm.). Because presence-only models sample the presence and pseudo-absence locations in different manners the proportion of presence within the sample does not represent the true prevalence of the species. Therefore, presence-only models with differing number of pseudo-absence sites can come up with dramatically different answers (A. Gelfand pers. comm.).

Finally, presence-only models do not propose a model to be estimated and therefore there is no likelihood function that can be used for statistical inference. Instead, presence-only models primarily fit surfaces or use mathematical values to describe a species relationship among a set of candidate sites. Without a defined likelihood function it is not possible to calculate confidence limits, probabilities of significance, or other values that allows the researcher understand the validity of the resulting model (Gelfand et al. 2006).

Instead of using the presence only modeling techniques we have chosen to use expert opinion models provided by species experts. There are several advantages to using these models in the HCP/NCCP planning process. The first benefit is that experts are identifying habitat as inherently good, not good relative to other sites in the area. This means that good sites have a relatively high probability of species occurrence. Second, research has shown that expert opinion models may overestimate suitable habitat (Johnson and Gillingham 2004). It is desirable to overestimate habitat for this plan because it allows for conservative estimates of impact (i.e., err on the side of overestimating impacts) and conservation of suitable areas. Finally, another important advantage of expert opinion models is that the variables and methods used to construct the models are easily understood and are reproducible by knowledgeable GIS practitioners. Application of presence-only statistical models requires specialized software and uses highly specialized statistical techniques.

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<sup>12</sup> A recent application of this type of model using BIOMAPPER for the East San Diego County HCP/NCCP had over 1,700 data points for peninsular bighorn sheep. The model was highly labor-intensive and was very sensitive to subjective assignments of break points for the correlation classifications. In the end, the model produced results that were only somewhat useful for the HCP/NCCP (S. Fleury pers. comm.).

### 3.3.4 Biological Diversity of Study Area

Species richness, a measure of the number of species in a defined region, is the most readily available measure of diversity and is generally accepted as an index of biological wealth of a region. The number of species that are endemic or unique to a geographic region can provide a measure of biological distinctiveness that is recognized as another measure of biological wealth. When NatureServe examined the diversity and endemism of species for all 50 states in the U.S., California ranked first in both categories (Stein 2002). A unique combination of climate, geography, and topography make California one of the most biologically diverse areas in the world. California is home to several of the nation's biological "hotspots" and has been identified as one of 25 "hotspots" of biodiversity worldwide (Stein et al. 2000).

With a geography that is bordered by the Pacific Ocean, includes San Francisco Bay, and expands eastward into the Sacramento and San Joaquin Valleys, the San Francisco Bay Area is one of only six global hotspots of species rarity in the United States (California Department of Fish and Game 2003b). The nine counties that comprise the Bay Area account for just over 18,000 square kilometers (km<sup>2</sup>), or nearly 5% of the state. Within that 5%, 64 of the 194 natural communities mapped by the California Gap Analysis occur (Wild 2002). This accounts for 33% of the natural communities in California.

More than a dozen major rivers flow into the Central Valley from the Sierra, Cascade, Klamath, and Coast Ranges and converge at the San Francisco Bay Delta; a vast network of wetlands that ultimately empties into Suisun Bay (California Department of Fish and Game 2003b). From the south several more rivers and creeks flow directly into San Francisco Bay, and the Bay itself is lined with tidal wetlands and marshes. These aquatic resources alone support over 200 species of birds, mammals, reptiles, and amphibians (California Department of Fish and Game 2003b). This interface with the San Francisco Bay, coupled with an assortment of upland habitat types with exceptional soil diversity and topography, makes the Bay Area a critical element in the biodiversity of California and of the world.

Situated on the south side of the Bay Area, Santa Clara County represents the extremes of the region. Due to the variation in topography and soil diversity within the County there are a wide array of natural community types and subsequently very diverse flora and fauna. The Santa Clara Basin Watershed Management Initiative (2003) reports that there are 93 identified special-status species in the Santa Clara Basin; 24 of which are either federal or state listed as threatened or endangered. The analysis conducted for this Plan identified 147 special-status species that occur or have the potential to occur in the Plan study area. Biological diversity is realized for all species groups and they are discussed in more detail below.

## Mammals

Like many southwestern states California has a high diversity of mammals due to its large size and unique environments. In fact, California has the most diverse mammal population of any state and has the most endemic mammal species, with 17 (Stein 2002; California Department of Fish and Game 2003b). The south San Francisco Bay region ranks as medium to high in mammalian species rarity and richness within the state (California Department of Fish and Game 2003b). This is largely driven by the salt marshes in the Bay/Delta region and the riparian habitats that drain to them. Of the 195 known mammalian species within the state (Stein 2002) over 20% can be found within Santa Clara County. Between 40 and 47 of those species can be found in Santa Clara Valley and between 48 and 55 can be found in the surrounding Santa Cruz Mountains and Diablo Range (California Department of Fish and Game 2003b). This represents a range between 20% and 28% of the known mammalian species of the state, respectively, for the major geographic features of the Plan study area.

## Birds

California supports one of the most diverse bird populations in the United States. In 2008 the list of birds that spend some part of the year in California was 636 species (California Bird Records Committee 2008). These species range from those who are endemic to California to those that are migratory species that spend part of the year in the state. The south San Francisco Bay region ranks as medium to high in bird species rarity and richness within the state (California Department of Fish and Game 2003b). This is largely driven by the salt marshes in the Bay/Delta region, which are particularly important to many migratory species and the riparian habitats and diverse upland habitats that make up the interior Bay Area. Of the 636 known bird species that either breed in or migrate through the state more than 45% can be found within Santa Clara County. An example of the bird diversity of the study area is provided by the list of 389 species that appear on the Checklist for Birds of Santa Clara County (South Bay Birders Unlimited 2007), 177 of which have been documented breeding in the county (Bousman 2005). Henry W. Coe State Park, the largest open space unit in the study area, supports 162 species of birds that have been confirmed in the park (Pine Ridge Association 2006a).

## Reptiles

California ranks fifth overall in reptile diversity by state in the United States with 86 known species (Stein 2002). The south San Francisco Bay region ranks as low to medium in reptilian species rarity within the state and medium to high in species richness (California Department of Fish and Game 2003b). The distribution of reptilian species within the study area is varied. The Santa Clara Valley supports under 10% of the known reptilian species within the state, while the Santa Cruz Mountains and the Diablo Range support up to 30% (California Department of Fish and Game 2003b). An example of the reptile diversity of the

study area is provided by the list of 27 reptile species found in Henry W. Coe State Park (Pine Ridge Association 2006b).

## Amphibians

California ranks ninth overall in amphibian diversity in the United States with 57 known species (Stein 2002). The south San Francisco Bay region ranks low in amphibian species rarity within the state but medium to high in species richness (California Department of Fish and Game 2003b). The distribution of amphibian species within the study area is varied. The Santa Clara Valley supports less than 10% of the known amphibian species within the state, while the Diablo Range supports 15% and the Santa Cruz Mountains support up to 30% (California Department of Fish and Game 2003b). An example of the amphibian diversity of the study area is provided by the list of 11 amphibian species found in Henry W. Coe State Park (Pine Ridge Association 2006b).

## Freshwater Fish

California ranks 34<sup>th</sup> overall in freshwater fish diversity by state in the United States with 62 known species (Stein 2002). The south San Francisco Bay region ranks low in fish species rarity within the state but medium to high in species richness (California Department of Fish and Game 2003b). The rivers and creeks that drain the Santa Cruz Mountains and the Diablo Range are home to 11 native and 19 nonnative species of fish (Santa Clara Basin Watershed Management Initiative 2003). This represents around 17% of the known freshwater fish species of the state. The most species rich is Coyote Creek with 10 native species followed by the Guadalupe River with seven (Santa Clara Basin Watershed Management Initiative 2003). In the south county, 11 native fish species are found within the Pajaro River watershed, although one of those species, the speckled dace, only occurs in the upper San Benito River, outside of the study area (J. Smith pers. comm. 2007). The abundance and distribution of native species have been reduced significantly over time through human impacts. The interface with the bay provides habitat for several species of anadromous fish including steelhead/rainbow trout, which has been observed in both Coyote Creek and the Guadalupe River (Santa Clara Basin Watershed Management Initiative 2003).

## Invertebrates

There are many thousands of invertebrate species in California, with an estimated 28,000 species of insects alone (California Department of Fish and Game 2003b). The south San Francisco Bay region and most of the study area ranks as medium in invertebrate species rarity within the state (California Department of Fish and Game 2003b). Most of that rarity is driven by unique grassland and scrub habitats that support rare species of plants. These rare plant species in turn support the complex life stages of many insects, especially butterflies and moths.

The biological diversity of invertebrates in Santa Clara County and the study area is largely unknown.

## Vascular Plants

California has the highest overall plant diversity in the United States with almost 8,000 known species (Hickman 1993; Stein 2002). Santa Clara County's moderate size and diverse physical and climatic characteristics create the conditions for a moderate to high level of botanical diversity. Unique habitats like serpentine grasslands in the study area support many special-status species, some of which are covered in this Plan. Of 8,363 plant taxa in California in the CalFlora database, Santa Clara County supports 1,778 native plant taxa and 507 nonnative plant taxa, or 27% of the plant taxa in the state in CalFlora (CalFlora Database 2006)<sup>13</sup>.

The exact number of vascular plants in the study area is unknown. However, floristic surveys of large areas of open space in the study area provide an indication of floristic diversity. For example, the Pine Ridge Association maintains a list of 675 vascular plants found in Henry W. Coe State Park (Pine Ridge Association 2006c).

### 3.3.5 Natural Communities and Land Cover Types

The NCCP Act requires that natural communities within the study area that could be affected by Plan implementation be identified in an NCCP. Natural communities are defined by the vegetative communities within them. Accordingly, the vegetative communities, or land cover types, within each natural community are described below and shown in **Figure 3-9**.

This Plan includes seven natural communities.

- Grassland.
- Chaparral and coastal scrub.
- Oak woodland.
- Riparian forest and scrub.
- Conifer woodland.
- Wetland.
- Open water.

<sup>13</sup> These values somewhat overestimate the actual number of plant taxa in California and Santa Clara County because species are counted separately from each variety or subspecies in the CalFlora database. For example, *Polygonum amphibium* is counted as a unique entry from *Polygonum amphibium* var. *emersum*.



In addition, two broad categories of non-natural land cover types are defined and described below.

- Irrigated agriculture.
- Developed.

The description of each natural community provides information on historic land cover, associated wildlife, ecosystem function, and threats. Each of the 37 land cover types used in this Plan is discussed in one of the natural communities, as shown in the hierarchy in **Table 3-1**. When data are available, vegetation associations are also described for each land cover type. Vegetation associations are distinct units of plant communities defined by the dominant species of plants that are consistently found on the landscape.

Quantitative data on vegetation and plant diversity is often lacking for regional conservation plans. However, a unique data set is available for the Santa Clara Valley HCP/NCCP. In the spring and summer of 2001 and 2002, botanists and volunteers from the CNPS and the CDFG conducted extensive quantitative sampling of vegetation along the approximately 7,000 acre Coyote Ridge (Evens and San 2004). The purpose of this study was to define and document the range of vegetation associations and plant diversity in the mostly serpentine communities of the ridge. Data from 200 locations were analyzed and grouped into discrete associations using standard cluster analysis and ordination techniques.

A total of 47 vegetation associations were defined and described in detail that support 329 unique species. Four of these associations were newly recognized and 32 of them were identified as provisional because they were based on less than 10 samples. Vegetations associations defined by this important study are summarized in this chapter under the relevant natural community as a way to describe the variety of vegetation associations within each land cover type. It is expected that many of these 47 vegetation associations occur elsewhere in the study area. However, it should be recognized that the relatively small sample area (only 1% of the study area) provides limited information on the vegetation diversity of the study area.

The results of the land cover mapping are summarized in **Table 3-7** and described below for each land cover type. See **Figure 3-10** for the land cover map using all land cover types.

## Grassland

*Grassland* consists of herbaceous vegetation dominated by grasses and forbs. Grassland in the study area is classified into six land cover types.

- California annual grassland.
- Non-serpentine native grassland (not mapped).
- Serpentine bunchgrass grassland.

- Serpentine rock outcrop / barrens.
- Serpentine seep.
- Rock outcrop (non-serpentine).

CDFG considers serpentine bunchgrass grassland a sensitive biotic community (California Department of Fish and Game 2003b). The land cover types serpentine seep, serpentine rock outcrop / barrens, and rock outcrop (non-serpentine) are typically associated with grasslands so are also discussed in this natural community.

## Historical Extent and Composition

Historical records do not provide definitive data on the distribution of native perennial grasslands, but research indicates human use of fire may have had a profound impact on the historic distribution and extent of grasslands. Prior to European settlement, native perennial grasslands in Santa Clara County were likely subject to regular burning by native American people. Keeley (2002) surmises that because dense scrub or chaparral had little value to native Americans, they used periodic burning to clear shrubs and provide habitat for fire-tolerant native grasses. Keeley (2002) also implies that the current mosaic of grassland is likely a result of historic vegetation management that favored open grasslands over chaparral.

Another human-made change to the landscape was initiated with the introduction and spread of many nonnative plants throughout California. The invasions began in 1769, when the first Spanish settlements were established at Monterey and San Diego, or possibly earlier. These introductions occurred by unassisted migration or by transport in the belongings or livestock of travelers from the Spanish settlements outside of California or in ship's cargo of coastal explorers. These non-native plant invaders included very aggressive annual grasses and forbs from the grasslands of the Mediterranean region that quickly replaced the natives, both with and without the influence of livestock grazing (Hendry 1931; Blumler 1992; Bartolome et al. 2007). The grazing of livestock in the study area by European settlers became more widespread after the gold rush of the 1850s. The combination of livestock grazing, drought, and spread of aggressive grasses and herbs dramatically reduced the abundance of native grasses and the extent of native grasslands throughout California (Bartolome et al. 2007). Grazing by livestock and wildlife continues today in almost all of the grasslands and other natural communities linked to grasslands (woodlands, riparian woodlands, and shrublands) of the County, although less intensively than in the past. While most grasslands in the County are now dominated by nonnative annuals, small patches of native grasses, below the resolution of the land cover map in this Plan, are found in many of these grasslands. There is some controversy over whether perennial grasses ever dominated California grasslands. It is likely that the Spanish mostly encountered annual grasslands that had a small representation of perennial species intermixed (Blumler 1992).

Further, recent scientific research suggests many of California's modern grasslands were not "grasslands," but might have been dominated instead by shrubs or annual forbs during the Native American period before arrival of the settlers and most of the invading non-native grasses (Hopkinson and Huntsinger 2005; D'Antonio et al. 2007). Schiffman (2007) suggests that drier valley and interior Coast Range "grassland" habitats were dominated by forbs during prehistoric times. Thus, without further study, we cannot be certain of the locations or extents of prehistoric grasslands in the County.

## Common Wildlife Associations

Characteristic wildlife species in grasslands include reptiles such as western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake (*Crotalis viridis*); mammals such as black-tailed jackrabbit (*Lepus californicus*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), American badger (*Taxidea taxus*), and coyote (*Canis latrans*); and birds such as burrowing owl (*Athene cunicularia*), short-eared owl (*Asio flammeus*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*). Annual grassland also provides important foraging habitat for turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), white-tailed kite (*Elanus leucurus*), and red-tailed hawk (*Buteo jamaicensis*).

Grassland-associated wildlife species covered under this Plan that are known to occur in the study area include San Joaquin kit fox (*Vulpes macrotis mutica*), western burrowing owl (*Athene cunicularia hypugae*), California red-legged frog (*Rana draytonii*), California tiger salamander (*Ambystoma californiense*), western pond turtle (*Clemmys marmorata*), and tricolored blackbird (*Agelaius tricolor*) (**Table 3-5**). California red-legged frog and California tiger salamander breed in aquatic habitats (e.g., ponds) within grasslands, and use grasslands as movement and aestivation (summer hibernation) habitat. Western pond turtle use grassland land cover adjacent to aquatic habitat as year-round and movement habitat. Serpentine grassland provides valuable habitat in the study area for all life stages of the federally threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*) (see the species account in **Appendix D** for more information). The butterfly also uses grasslands as movement corridors between isolated serpentine grassland patches. These grasslands also provide unique habitat for a variety of special-status invertebrates that are not covered by this plan, including several butterfly species and Horn's microblind harvestman (*Microcina homi*).

## Grassland Land Cover Types

Within the Plan study area, California annual grassland was identified by its smooth, pale signature on aerial photograph, lacking the dark green signatures of woody plants taken during the summer months. Native grasslands could not be distinguished reliably on the available imagery.

### California Annual Grassland

*Annual grassland* or *nonnative grassland* is an herbaceous plant community dominated by nonnative annual grasses (Holland 1986; Sawyer and Keeler-Wolf 1995). In the study area, annual grassland was mapped where grasses and forbs dominate the land cover and where trees and shrubs comprise less than 10% canopy cover. The dominant grasses in the study area generally consist of introduced annual grasses from the Mediterranean basin, including wild oats (*Avena barbata* and *A. fatua*), soft brome (*Bromus hordeaceus*), foxtail chess (*B. madritensis*), leporinum barley (*Hordeum murinum* ssp. *leporinum*), Italian ryegrass (*Festuca perennis* [*Lolium multiflorum*]), barbed goatgrass (*Aegilops triuncialis*), harding grass (*Phalaris aquatica*), shiver grass (*Aira caryophyllaea*), rat-tail fescue (*Festuca* [*Vulpia*] *myuros*), ripgut brome (*Bromus diandrus*), nit grass (*Gastridium phleoides* [*G. ventricosum*]), bentgrass (*Polypogon* [*Agrostis*] *viridis*), and small fescue (*Festuca* [*Vulpia*] *microstachys*) (Evens and San 2004). The associated herbaceous cover includes native and nonnative forbs. Common species in the study area include many clover species (*Trifolium* spp.), filaree species (*Erodium* spp.), lupine species (*Lupinus* spp.), four-spot (*Clarkia purpurea* ssp. *quadrivulnera*), California poppy (*Eschscholzia californica*), purple owl's-clover (*Castilleja exserta*), Ithuriel's spear (*Triteleia laxa*), black mustard (*Brassica nigra*), starthistle species (*Centaurea* spp.), wavyleaf soap plant (*Chlorogalum pomeridianum*), common yarrow (*Achillea millefolium*), and common fiddleneck (*Amsinckia menziesii*).

California annual grassland occupies an estimated 81,795 acres (18%) of the study area (Table 3-7 and Figure 3-10). This land cover type is generally found in valley bottoms. In the study area, it is found at low elevations along the eastern side of the Santa Clara Valley bordering the foothills, and on ridges on dry south- and west-facing slopes. Annual grassland is also common on both sides of the Pacheco Pass in the southern portion of the County. It is often found intermingling with oak woodlands and chaparral/scrub communities.

One covered plant that may be found on this land cover type is fragrant fritillary (*Fritillaria liliacea*). This species is restricted to specific habitat elements and micro-site characteristics within California annual grassland.

### Native Grassland (Non-Serpentine)

Native, *non-serpentine grasslands* are patchily distributed in the study area and generally occur as small patches within the larger annual grassland complex. Accordingly, *native grassland* contains an abundance of nonnative annual grasses mixed with perennial grasses and forbs. Native grassland could not be distinguished from annual grassland on aerial photographs of the study area. Consequently, this land cover type was mapped as annual grassland.

Soils which support populations of native non-serpentine grasslands tend to be deep (50–100 cm), high in clay content with few rocks, and mostly on north- and east-facing slopes (Keeley 1993). There are several types of native grasses present in the study area, including purple needlegrass (*Stipa* [*Nassella*] *pulchra*), big squirreltail (*Elymus multisetus*), Torrey's melicgrass (*Melica torreyana*), creeping ryegrass (*Elymus* [*Leymus*] *triticoides*), small fescue, small-flowered needlegrass (*Stipa* [*Nassella*] *lepida*), one-sided bluegrass (*Poa secunda*), blue

wildrye (*Elymus glaucus*), and California melica (*Melica californica*). Native, non-serpentine grasslands in the study area are characterized by the following grassland associations based on quantitative vegetation sampling conducted by the CNPS along extensive areas of Coyote Ridge (Evens and San 2004).

- **Italian ryegrass-purple needlegrass-Gambel's dwarf milkvetch-shining pepperweed (*Lepidium nitidum*) grassland association.** This association can be found on both serpentine and non-serpentine soils but typically occurs in herbaceous stands that have deep soils with high clay content (Evens and San 2004). Plants characteristic of this community are Italian ryegrass, purple needlegrass, hayfield tarweed (*Hemizonia congesta* ssp. *luzulifolia*), beaked cryptantha (*Cryptantha flaccida*), Douglas' microseris (*Microseris douglasii*), blue dicks (*Dichelostemma capitatum*), dwarf plantain (*Plantago erecta*), California poppy, Gambel's dwarf milkvetch, calf lotus (*Acmispon [Lotus] wrangelianus*) and reticulate seeded spurge (*Euphorbia spathulata*).
- **Italian ryegrass-purple needlegrass-coast range false bindweed grassland association.** This association can be found on both serpentine and non-serpentine soils but typically occurs in herbaceous stands that have deep soils with high clay content (Evens and San 2004). Plants characteristic of this community are Italian ryegrass, purple needlegrass, dwarf plantain, coast range false bindweed (*Calystegia collina*), California poppy, and common yarrow.
- **Creeping ryegrass-Italian ryegrass grassland association.** This association is found in the study area in both serpentine and non-serpentine soils of marine origin that experience seasonal flooding (Evens and San 2004). Characteristic species are creeping ryegrass, Italian ryegrass, common fiddleneck, wild oat, soft brome, reticulate seeded spurge, prickly lettuce (*Lactuca serriola*), and California blue-eyed grass (*Sisyrinchium bellum*).
- **Torrey's melicgrass grassland association.** This association is found on both non-serpentine and serpentine soils. Common species are Torrey's melicgrass, Italian ryegrass, soft brome, common yarrow, coast range false bindweed, shooting star species (*Dodecatheon* sp.), naked wild buckwheat (*Eriogonum nudum*), California poppy, and small fescue.
- **Big squirreltail (*Elymus multisetus*)-dwarf plantain-Italian ryegrass association.** Big squirreltail grassland is generally found on sedimentary and serpentine soils. Characteristic species are big squirreltail grass, Italian ryegrass, purple needlegrass, pine bluegrass, soft brome, California poppy, beaked cryptantha, dwarf plantain, California goldfields (*Lasthenia californica*), common yarrow, and wavyleaf soap plant.
- **Small fescue-dwarf plantain grassland association.** Small fescue grassland is typically found on well-developed soils on serpentine and on sedimentary soils that are mesic in spring. Common species are small fescue, common yarrow, soft brome, naked wild buckwheat, California poppy, Italian ryegrass, dwarf plantain, wavyleaf soap plant, Italian ryegrass, and common California-aster (*Corethrogyne [Lessingia] filaginifolia*).

The extent of non-serpentine native grassland in the study area is unknown.

No covered plants may be found on this land cover type.

### **Serpentine Bunchgrass Grassland**

*Serpentine bunchgrass grassland* occurs on ultramafic soils derived from serpentinite. Serpentine soils generally have lower overall cover of vegetation as well as lower cover of nonnative species than annual grasslands, and are characterized by low plant growth and productivity (McNaughton 1968; Holland 1986). This is due in large part to the high content of heavy metals in the soil such as chromium, nickel, and cobalt which are toxic to most plants, very low calcium/magnesium ratios, unusually high levels of iron, and limiting levels of nitrogen, phosphorous, potassium, and calcium, all of which are important plant nutrients (Kruckeberg 1984). Many serpentine species are partially or completely confined to growing on this substrate (Safford et al. 2005). Native bunchgrasses in serpentine habitat are generally similar to those in non-serpentine habitats, although serpentine populations may be more tolerant of heavy metals present in the soil and may have lower growth rates compared to non-serpentine populations (Huntsinger et al. 1996).

Serpentine bunchgrasses typically occur in patches of both single and multiple species (McCarten 1987). As noted above, nonnative annuals are much less dominant in serpentine areas, although increasing nitrogen deposition from air pollution has increased the productivity of serpentine soils and allowed a greater number of nonnatives to invade (Evens and San 2004; Harrison et al. 2003; Weiss 1999). Native grasses typically found on serpentine soils in the study area include big squirreltail, creeping ryegrass, purple needlegrass, Torrey's melicgrass, and small fescue. Some common herbaceous species are fringed sidalcea (*Sidalcea diploscypha*), jeweled onion (*Allium serra*), serpentine linanthus (*Leptosiphon* [*Linanthus*] *ambiguus*), and Franciscan wallflower (*Erysimum franciscanum*) (Evens and San 2004).

Although the total coverage of serpentine soils is relatively small state-wide (1.5%), 13% of plant species endemic to California are serpentine endemics (Safford et al. 2005). Many of these occur in the San Francisco Bay area. There are a variety of ultramafic affinities for serpentine species that can vary by geography. For instance, serpentine species can be strict endemics (95% of the time they are found growing on serpentine), strong indicators (about 70% of the time they are found growing on serpentine), and weak indicators (about 60% of the time they are found growing on serpentine). The herbaceous species listed above have serpentine affinities that fall between strict endemic and strong indicator.

Serpentine grasslands in the study area are characterized by the following associations based on quantitative vegetation sampling conducted by CNPS along extensive areas of Coyote Ridge (Evens and San 2004).

- **Italian ryegrass-purple needlegrass-Gambel's dwarf milkvetch-shining pepperweed grassland association.** Plants typical of this association can be found above in native grasslands. Additional species characteristic of this association on serpentine soils are smooth lessingia (*Lessingia micradenia* var. *glabrata*), most beautiful jewel-flower (*Streptanthus albidus* ssp.

*peramoenus*), and Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*).

- **Italian ryegrass-purple needlegrass-coast range false bindweed grassland association.** Plants typical of this association can be found above in native grasslands. Additional species characteristic of this association on serpentine soils are smooth lessingia, Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*), and jeweled onion.
- **Creeping ryegrass-Italian ryegrass grassland association.** Plants typical of this association can be found above in native grasslands. An additional species characteristic of this association on serpentine soils is smooth lessingia.
- **Torrey's melicgrass grassland association.** Plants typical of this association can be found above in native grasslands. Additional species characteristic of this association on serpentine soils are smooth lessingia, jeweled onion, and Santa Clara Valley dudleya.
- **Big squirreltail (*Elymus multisetus*)-dwarf plantain-Italian ryegrass association.** Plants typical of this association can be found above in native grasslands. Additional species characteristic of this association on serpentine soils are jeweled onion and most beautiful jewel-flower. Other occasional associates are Santa Clara Valley dudleya and serpentine linanthus.
- **Small fescue-dwarf plantain grassland association.** Plants typical of this association can be found above in native grasslands. Additional species characteristic of this association on serpentine soils are Franciscan wallflower, jeweled onion, and most beautiful jewel-flower. Fragrant fritillary and serpentine linanthus also occasionally may be present.

Covered plants that may be found in serpentine bunchgrass in the study area include the following: Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*), coyote ceanothus (*Ceanothus ferrisiae*), fragrant fritillary, Santa Clara Valley dudleya, smooth lessingia, Mt. Hamilton thistle, Metcalf canyon jewel-flower, and most beautiful jewel-flower (Evens and San 2004; California Natural Diversity Database 2008, 2012; also see **Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within serpentine bunchgrass grassland.

Certain species not considered serpentine endemics or indicators but commonly found in serpentine soil areas, host or provide nectar for the federally threatened Bay checkerspot butterfly. Such species include dwarf plantain, purple owl's-clover, California goldfields, common muilla (*Muilla maritima*), and lomatium species (*Lomatium* spp.) (Weiss 1999).

Serpentine bunchgrass grassland occupies approximately 10,308 acres (2.2%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type was mapped where grasslands intersected either serpentine soils or serpentine bedrock (**Figure 3-4**). In the study area, serpentine bunchgrass grassland is found primarily northwest of Anderson Lake along Coyote Ridge and the Silver Creek Hills. Smaller patches of serpentine bunchgrass grassland can be found in the

Santa Theresa Hills, on Communications Hill, Tulare Hill, and west of Morgan Hill.

### **Serpentine Rock Outcrop / Barrens**

*Serpentine rock outcrops* are exposures of serpentine bedrock that typically lack soil and are sparsely vegetated. Serpentine barrens are areas of exposed serpentine soil that support little vegetation. They were identified based on visible rock outcroppings or barren areas on the aerial imagery intersecting with the serpentine rock or serpentine soils layers respectively; there was no minimum mapping unit. Covered plants that may be found on this land cover type include Metcalf canyon jewel-flower, most beautiful jewel-flower, smooth lessingia, and Santa Clara Valley dudleya (California Natural Diversity Database 2008, 2012; California Native Plant Society 2007).

This land cover type is likely underrepresented in the land cover map for the study area (Kruckeberg 1984; Wagner et al. 1991) because these features are difficult to see on aerial photographs, and were difficult to recognize in the field from a distance.

Covered plants that may be found in serpentine rock outcrop/barrens in the study area include the following: Tiburon Indian paintbrush, Santa Clara Valley dudleya, smooth lessingia, Metcalf canyon jewel-flower, and most beautiful jewel-flower (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within serpentine rock outcrop.

Serpentine rock outcrops occupy an estimated 260 acres (0.05 %) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is found strictly in areas of serpentine soils or geology. In the study area, serpentine rock outcrops are found in the same locations as serpentine bunchgrass grassland.

### **Serpentine Seep**

*Seeps* are otherwise dry areas where water penetrates the surface and creates a small wetland habitat that supports wetland vegetation. These provide a source of drinking water for wildlife in the area. Serpentine seeps typically occur within a matrix of serpentine grassland so they are discussed in the grassland natural community. Serpentine seep vegetation associations found in the Plan study area are described below (Evens and San 2004).

- **Mt. Hamilton thistle-twotooth sedge (*Carex serratodens*)-meadow barley forbland<sup>14</sup> association.** This association is found exclusively on serpentine seeps. Plants characteristic of this association are Mt. Hamilton thistle, twotooth sedge, meadow barley (*Hordeum brachyantherum*), hayfield tarweed, narrow-leaved wild-lettuce (*Lactuca saligna*), common yarrow, California poppy, Italian ryegrass, meadow barley, irisleaf rush (*Juncus xiphioides*), and seep monkey flower (*Mimulus guttatus*). Additional common species in this association are bentgrass, purple needlegrass, hoary coffeeberry (*Frangula californica* ssp. *tomentella* [*Rhamnus tomentella*]),

<sup>14</sup> A *forb* is another term for an herbaceous plant. A *forbland* is a vegetation association dominated by forbs (similar in concept to a grassland).



rabbit's foot (*Polypogon monspeliensis*), smooth lessingia, and most beautiful jewel-flower.

- **Mt. Hamilton thistle-hayfield tarweed forbland association.** This association is found exclusively on serpentine seeps. Plants characteristic of this association are Mt. Hamilton thistle, hayfield tarweed, irisleaf rush, rabbit's foot, hoary coffeeberry, and smooth lessingia.
- **Mt. Hamilton thistle-seep monkey flower-short-spiked hedge nettle forbland association.** This association is found exclusively on serpentine seeps. Plants characteristic of this association are Mt. Hamilton thistle, sourclover (*Melilotus indicus* [*M. indica*]), seep monkey flower, short-spiked hedge-nettle (*Stachys pycnantha*), yellow star thistle (*Centaurea solstitialis*), soft brome, California poppy, irisleaf rush, Italian ryegrass, common yarrow, California sagebrush (*Artemisia californica*), foxtail chess, Pacific false bindweed (*Calystegia purpurata*), medusa-head (*Elymus* [*Taeniatherum*] *caput-medusae*), and most beautiful jewel-flower.
- **Irisleaf rush herbaceous association.** This association is found exclusively on serpentine seeps. Plants characteristic of this association are irisleaf rush, Italian ryegrass, twotooth sedge, Mt. Hamilton thistle, Baltic rush (*Juncus balticus*), hyssop loosestrife (*Lythrum hyssopifolia*), and rabbit's foot.
- **Leather oak-hoary coffeeberry-bigberry manzanita shrubland.** This association is found in serpentine seeps and in riparian drainages on serpentine. Leather oak (*Quercus durata*) and hoary coffeeberry are co-dominant, followed by bigberry manzanita (*Arctostaphylos glauca*). The shrub layer has sparse to dense coverage (9–70% on Coyote Ridge) of Italian ryegrass, slender wild oat, ripgut brome, hayfield tarweed, seep monkey flower, and Mt. Hamilton thistle are all common in the open herb layer.

One covered plant, Mt. Hamilton thistle, is restricted to serpentine seeps and streams and drainages through serpentine soils (**Table 3-6**). Serpentine seeps were mapped on 34 acres (0.01%) of the study area (**Table 3-7** and **Figure 3-10**).

### Rock Outcrop (Non-Serpentine)

Frequently encountered features in grasslands are *rock outcrops*, which are exposures of bedrock that typically lack soil and have sparse vegetation. Within the study area, several types of rock outcrops are present and are derived from sedimentary, volcanic, and metamorphic sources. Rock outcrops identifiable on aerial photographs were mapped based on their unique aerial photograph signatures. Rock outcrop signatures appear as textured areas with mottled coloring that contrasted in color and texture with the surrounding cover types on aerial photographs. There was no minimum mapping unit.

Rock outcrops host common wildlife species such as western fence lizard and western rattlesnake. These species may use outcrops for basking and as foraging areas. Common birds include rock wren (*Salpinctes obsoletus*) and several species of raptors that use rock outcrops for nesting or roosting. Rock outcrops with crevices or caves could host roosting bats.

Most beautiful jewelflower may be found on non-serpentine rock outcrops (**Table 3-6**).

Rock outcrops are a rare land cover type, totaling 87 acres (0.02%) of the study area (**Table 3-7** and **Figure 3-10**). They are primarily found in annual grasslands although they also can be present in chaparral and oak woodlands. This land cover type is likely underrepresented in the land cover map because these features are difficult to see on aerial photographs, particularly if they were below a chaparral or woodland canopy, and were difficult to recognize in the field from a distance. Accordingly, many small areas of rock outcrops are likely included in the chaparral/scrub, grassland, and oak woodland land cover types.

## Ecosystem Functions

### Function and Integrity

The grassland types within the study area function as a dominant natural community, linking small and large patches of all other natural communities in the landscape such as oak woodland, riparian and aquatic communities, northern mixed chaparral/chamise chaparral, and northern coastal scrub/Diablan sage scrub. Rock outcrops, barrens, and seeps are contained within the larger matrix of grasslands, and in some cases, the functions and threats to the integrity of these land cover types differs from the larger grassland matrix. This section primarily addresses the grassland types. Differences, where relevant, are noted for the small-scale land cover types contained within grasslands.

Grasslands provide critical upland habitat for a variety of amphibians dependent on adjacent aquatic habitats such as ponds and seasonal wetlands. These amphibians move through grasslands during the rainy season to disperse to other aquatic sites, and may reside in moist refuges, such as burrows and piles of litter and debris, within grasslands during the dry season. Grasslands are important for burrowing rodents such as ground squirrels and gophers. Rodent burrows, in turn, provide key habitat for a variety of other species, including burrowing owls. The diverse and abundant rodent community supports an assemblage of raptors that feed on them, including golden eagle (*Aquila chrysaetos*), northern harrier, and white-tailed kite. Serpentine grasslands are important habitat for all life stages of the federally threatened Bay checkerspot butterfly, and a host of other rare species.

Grasslands also help maintain water supplies and water quality through soil moisture retention and infiltration and by filtering out sediment, nutrients, and pathogens from run-off. They provide wildlife habitat, storage of carbon, and forage for grazing livestock. The key characteristics of grassland habitat that contribute to these functions are a high cover of herbaceous vegetation. A mix of woody cover in grassland (mosaic of shrubs or savanna) is also important to resist soil erosion and mass-wasting, and benefits some special-status animals.

The replacement of native grasses and herbs by fast-growing nonnative annual grasses and herbs has had a profound effect upon ecosystem functions in grasslands. The complex system of native grasses, forbs, shrubs, and animals of

grassland habitats, plus the effects of lightning-caused wildfire and Native American management during prehistoric times has been dramatically altered. For example, the exotic annuals germinate and grow faster and can deplete soil moisture and reduce light and nutrient availability to the natives. However, seed limitation due to low production or small populations may also limit native grass establishment. Both native and non-native shrubs and trees can invade California grasslands, causing changes in fire fuel structure, carbon storage, animal habitat, and facilitation of the establishment of other woody plants. The exotic grasses and forbs have a larger and more persistent seed bank than the natives, and distribute seeds abundantly as seed rain. The exotic species can thus rapidly colonize disturbance areas, such as gopher mounds, and inhibit establishment of the native species. Grazing livestock are likely to be important dispersal agents for the exotic plants, but grazing intensity has not been linked by scientific evidence to current invasions of exotic plants into California grasslands (Jackson and Bartolome 2007).

The widespread occurrence of non-native species has altered the response of California grasslands to burning. Increased fuel loading around trees and native grasses can result in reduced survival of the native grasses. Non-native grasses are favored where atmospheric nitrogen deposition has increased or where nitrogen-fixing shrubs, such as brooms (*Genista* spp. or *Cytisus* spp.) have invaded and elevated soil nitrogen. Serpentine soils are particularly vulnerable to such means of invasion. Phenology of the converted grassland is dramatically different from that of the prehistoric native grasslands. The exotic annual grasses germinate and grow in synchrony with the rains of fall through spring, while the native perennial grasses extend their growth and transpiration of soil moisture into the summer months. The roots of the exotic annual grasses are generally less deep than those of the native perennial grasses, which can tap deeper soil moisture. The absence of perennial grasses in the converted grasslands can lead to reservoirs of deep soil moisture during the summer, which may be accessed by deep-rooted pest plants, such as yellow starthistle. Different microbial compositions have been found in the soils of California grasslands and planted containers with exotic annual versus native perennial grasses, but less is known about nutrient feedbacks and effects on soil structure. In a few cases, pathogens of grassland plants also appear to facilitate dominance of the exotic species.

### **Natural Disturbance**

The key natural disturbances that have shaped and continue to influence grassland composition and extent are fire and grazing. **Figure 3-11** shows areas currently grazed in the study area. Both of these disturbances are now largely controlled by humans. Therefore, by extension, the continuing introductions and naturalization of aggressive non-native plants should also be considered an important factor influencing grasslands, and one also largely controlled by humans (Randall and Hoshovsky 2000). Nitrogen deposition into grasslands near air pollution sources and the resultant increase in productivity of the soils that has facilitated the increased invasion by nonnative species is a relatively recent anthropogenic disturbance. The disturbances related to nitrogen deposition and non-native plant introductions are discussed further under *Threats* below.

Periodic fire is an important influence on the grassland community. Historically and prehistorically, fires from both lightning strikes and human ignition kept woody vegetation from invading grassland (where the soil conditions are appropriate) and converting it to coastal scrub or oak woodland. Grassland was likely the dominant vegetation community, especially near prehistoric and historic settlements and travel routes, and in association with brush clearing for “rangeland improvements” to increase livestock forage (Reiner 2007; Tyler, Odion, and Callaway 2007). The prehistoric burning apparently resulted in spatially patchy grasslands in a mosaic with woody vegetation (Keeley 2002). The grasslands were kept open by fire, drought, and possibly some influence of native grazers, such as tule elk and pronghorn. However, prior to Native American occupancy and their frequent burning, Ford and Hayes (2007) speculate that many of the grasslands within the range of coyotebrush would have been brushlands. Today, in the absence of frequent extensive fire and moderate or higher intensity livestock grazing, the grasslands within the range of coyotebrush have succeeded or will succeed in the future to northern coastal scrub and eventually mixed woodland, except on the hottest south-facing slopes and shallow soils.

Prescribed burning is considered an important management tool in grasslands and other natural communities, but it has significant practical limitations. Such burning is becoming increasingly difficult to implement due to cost, safety concerns from expanding urban and rural development, and difficulty obtaining permits because of air quality concerns. It has not been feasible in most places to burn frequently enough to control the spread of woody species into existing grassland, or to reduce the cover of woody vegetation within grasslands, because of the natural resistance and resilience of the woody plants to a single burn (Ford and Hayes 2007). Attempts to restore pre-historic or historic fire regimes in grasslands in order to increase native grassland plants is not recommended due to uncertainties of the prehistoric grassland characteristics and the risk of facilitating invasions by non-native plants (Reiner 2007). However, livestock grazing has continued on most rangelands of the study area (see **Figure 3-11**) since introduction by the Spanish settlers, and its effects on both fire hazard reduction and shrub invasion are understood and can be prescribed (Ford and Hayes 2007). While early livestock grazing practices are acknowledged to have been excessive and damaging to grasslands and associated resources in some places, they are far less so today. In fact, livestock grazing in the region is regarded as generally beneficial and has maintained suitable habitat conditions for many special-status grassland-dependent species since the conversion from native species to exotic annuals in the grasslands in the 18th century or earlier.

Grassland is considered a fire-tolerant community. The direct effect of fire on grassland is to remove much or nearly all of the aboveground herbaceous biomass, depending on fire severity. Often the low-intensity prescribed fire moves so quickly and the residue (or thatch) is moist enough that the fire burns only above the lower few centimeters of material, leaving much unburned or only charred on the ground. Fires in grassland are described as *stand-replacing fires*. However, the immediate effect of this biomass removal on annual grasses is negligible, as they have typically completed their growth cycle before fires occur (Howard 1998). Their seeds are typically well dispersed, and many can be

protected by the cover of litter and in cracks in the soil surface over which a fire passes. Perennial bunchgrasses suffer a temporary loss of foliage, but typically regenerate immediately through tillering and regrowth of green foliage that typically remains in the center of grass tussocks (Steinberg 2002).

The immediate effect of a fire in grasslands is typically an increase in annual forb germination and flowering and an increase in overall productivity in response to the light and nutrients made available by the removal of the thatch layer during the following growing season (Harrison et al. 2003). In the two to three years following a fire, the elimination of the thatch layer (if present) may shift the species composition of grasslands towards annual forbs and small-seeded species such as purple needlegrass and little quaking grass (*Briza minor*) (Howard 1998; Steinberg 2002). In the absence of grazing, however, a thatch layer can re-establish (depending on favorable weather), and this effect will disappear. Burning appears to have little long-term effect on annual grassland (Heady 1988; Paysen et al. 2000; Kyser and Di Tomaso 2002). In grasslands that are already dominated by nonnative annual grasses, nonnatives may increase their dominance following fire by outcompeting natives for the newly available space and light. Native grasses may increase their dominance in serpentine grasslands following fire through the same mechanism (Harrison et al. 2003).

Livestock grazing within grasslands is an important disturbance that mimics some of the functions of fires and of native herbivores that are no longer present (e.g., Tule elk, pronghorn). Livestock grazing is also an important management tool to combat relatively new threats such as loss of suitable habitat for special-status species due to dense growth during wet years and invasions of woody plants (Ford and Hayes 2007), and increased invasive nonnative plants in serpentine grasslands due to atmospheric nitrogen deposition (Weiss 1999). The primary drivers of annual grassland composition are the environmental conditions of each site, including soils and annual weather. Bartolome (2011) has estimated that annual weather fluctuations cause about 80% of the shifts in composition of California annual grasslands. Management, including grazing systems, therefore has a limited influence. As a result, studies of grazing effects on native species populations have mixed results, and must be interpreted carefully.

Properly timed grazing can be used to suppress non-native herbaceous competition with native plants, and may favor native grasses and wildflowers. The density and vigor of native perennial grasses can be improved when intensive spring grazing is curtailed just before the existing native perennial grasses re-grow, flower, and set seed (Menke 1992). This specialized grazing removes much of the density and mass of the non-native annual grasses through their growing season, which is shorter than for the native perennial grasses. Curtailing grazing at that time simultaneously allows the native perennial grasses to grow, flower, and set seed before the soil moisture is exhausted. Other research has shown mixed results, and suggests caution in grazing prescriptions to favor native grasses. A study at Jepson Prairie by Dyer, Fossum, and Menke (1996) found that grazing was not effective to increase purple needlegrass and that climate is the more influential factor. Hatch et al. (1999) suggest that different native grasses and forbs have different and sometimes conflicting

responses to management, and therefore more research is needed to guide grazing and burning practices. In a study of coastal prairie, Hayes and Holl (2003) found that native grasses were not more abundant where grazed than where ungrazed. However they found native forbs were more abundant where grazed due the suppression of non-native herbaceous competition and build-up of thatch. Spring and summer wildflowers of grasslands are typically more showy where grazing has occurred (Edwards 1992). Furthermore, Hayes and Holl (2011) found that stands of native grasses are slow to respond to treatments, and fluctuated in response to multiple factors other than management, including annual weather patterns; and that grazing, even when controlled with specific frequencies, holds little promise for increasing native species over the long term.

Grazing may have little effect on species diversity in serpentine grasslands (Harrison 1999). In one case in Santa Clara County reported by McCarten (1987), grazing was associated with a decrease in native bunchgrass species compared to recently ungrazed sites, but that could have been related to non-grazing management or microhabitat differences. Because invasive nonnatives are generally not tolerant of serpentine soils, these species are less invasive in serpentine bunchgrass grasslands than in non-serpentine grasslands (Harrison 1999). Studies in Bay checkerspot butterfly habitat have found that livestock grazing is necessary to prevent nonnative species from becoming dominant, and promote the establishment and persistence of nectar species preferred by the Bay checkerspot butterfly (Harrison 1999; Weiss 1999; Weiss and Wright 2005, 2006; Weiss, Wright, and Niederer 2007). Harrison and Viers (2007) caution that the known invasions of non-natives into serpentine grasslands can be partly a result of slower rates of spread, and that factors other than nitrogen deposition could undermine the resistance of these grasslands, including evolution of serpentine-tolerance in existing non-natives, arrival of new serpentine tolerant non-natives (notably goatgrass [*Aegilops cylindrica*] and medusa-head), and modification of the soils to favor more invasions. They also caution that livestock grazing and infrequency of fire in serpentine grasslands can contribute to declines in native species.

In general, livestock grazing has been associated with benefits to serpentine grasslands (Harrison and Viers 2007). Reported studies indicate that removal of grazing had either no effect on plant species composition or the abundance of native forbs decreased, while grazing increased diversity of native annual forbs. Low-statured native annual forbs are expected to benefit from moderate grazing by reducing the thatch produced by the non-native annual grasses.

Grazing might have a negative effect on the physical structure and native seed banks of serpentine seeps, serpentine rock outcrops, and serpentine barrens that are contained within the larger grassland matrix, but no scientific research has been published on this topic. These small land cover types might be somewhat sensitive to cattle traffic. Most seep soils are moist or saturated for most or all of the year, while rock outcrop/barrens usually have low plant cover and minimal soil and seed bank accumulations. Depending on intensity and frequency of grazing traffic, this can be a long-term effect that is very difficult to restore. Fencing can be used to eliminate or minimize access by livestock to sensitive serpentine seeps, rock outcrops, or barrens.

### Threats

The primary known threats to conservation of California grasslands are: climate change; human development (habitat destruction and fragmentation); invasive species (pathogens, plants, animals); altered disturbance regimes; and air pollution.

The conservation threats associated with human development, including habitat destruction and fragmentation due to conversion of natural grasslands to residential and commercial development, conversion to cultivated agriculture, road construction, and the patterns of such development across the landscape, are the subjects of this Habitat Plan, and are discussed in other chapters.

The threats to conservation of grasslands posed by continuing invasions and infestations of aggressive non-native plants have been described above. In general, and perhaps most significantly, the non-native grasses and forbs of modern grasslands now pose the threat of significant habitat degradation if not grazed by livestock or otherwise treated to maintain suitable habitat structure and reduce competition.

Atmospheric nitrogen enrichment fosters the invasion of nonnative species, which replace native species. This is a threat in all grasslands downwind of air pollution sources, but particularly in serpentine grasslands, where the nectar plant hosts to the bay checkerspot butterfly are affected (Weiss 1999). Absence of grazing thus threatens the butterfly populations. In Santa Teresa County Park and other locations, several populations of Bay checkerspot butterfly declined substantially after grazing was halted. Once grazing ceased, the numerous non-native grasses and forbs present in the serpentine grasslands grew tall and dense each year, and through competition reduced the butterfly's host plants (U.S. Fish and Wildlife Service 2001). The USFWS recognizes activities that threaten the butterfly's critical habitat, include ground disturbance, removing vegetation, altering or removing grazing practices, application of pesticides and biological agents, and some recreational activities. In the case of Santa Teresa County Park, the USFWS recognized that re-introduction of grazing would be needed to ensure recolonization of the butterfly.

In addition, introduced pathogens can indirectly facilitate the invasions of non-native plants, reduce savanna and woodland canopies and thus expand grasslands, and reduce populations of key native grassland birds and rodents (D'Antonio et al. 2007). The threats to conservation of grasslands posed by altered disturbance regimes due to fire and grazing have been discussed above. Studies have demonstrated that well-managed livestock grazing within grasslands is critical to maintain populations of Bay checkerspot butterfly (Harrison et al. 2003; Weiss and Wright 2005, 2006; Santa Clara Valley Transportation Authority 2006). However, as noted above, grazing might be detrimental to serpentine seeps and most rock outcrop/barrens. The threat of reduction or elimination of grazing as a habitat management has also been discussed above.

Serpentine seeps are a type of wetland and many of the threats discussed in the wetland section below are applicable to seeps within grasslands. In particular, alteration of hydrologic regimes by adjacent land uses and development can

change and in some case remove the water source for these seeps. This can result in partial or complete loss of seep wetlands.

Other threats to grasslands include feral pigs, power lines, off-road vehicle activity, improper burning regimes, and road and trail construction (Evens and San 2004).

## Chaparral and Northern Coastal Scrub

*Chaparral shrub communities* are found throughout California on rocky, porous, nutrient-deficient soils and on steep slopes up to 2000 m in elevation (Keeley 2000). These communities are dominated by densely packed and nearly impenetrable drought-adapted evergreen woody shrubs, 1.5–4 meters tall, that possess small, thick, leathery sclerophyllous leaves (Hanes 1988; Keeley 2000). Herbaceous and arboreal growth forms are often lacking or play minor roles in this community (Keeley 2000). Chaparral species have both deep and shallow roots that allow them to tap water in several soil layers (Schoenherr 1992). The deep roots also allow chaparral to tolerate summer drought conditions and stay active during this period of water stress. Chaparral is divided into two land cover types for this Plan.

- Northern mixed chaparral/chamise chaparral.
- Mixed serpentine chaparral.

CDFG considers the latter a sensitive biotic community (California Department of Fish and Game 2007). *Northern coastal scrub*, in comparison, is generally characterized by low shrubs, usually 0.5–2 meters tall with soft non-sclerophyllous leaves, interspersed with grassy openings (Holland 1986). Although coastal scrub is found in both northern and southern California, the form and variety of species varies greatly between the two regions. Coastal sage scrub in southern California is characterized by drought-deciduous shrubs that lose their leaves with the onset of arid summer conditions. In southern California this community lacks a significant herb layer. Northern coastal scrub is characterized by the absence of drought-deciduous shrubs and the presence of an herb-rich community, which is likely a result of plentiful annual rainfall and regular summer fog (Heady et al. 1988; California Partners in Flight 2004). Northern coastal scrub is also less diverse floristically than coastal sage scrub and shrubs are generally taller and more densely spaced (California Partners in Flight 2004). The range of this northern community can be defined as a narrow coastal strip from southern Oregon to Pt. Sur in Monterey County (Holland 1986; Heady et al. 1988). Northern coastal scrub in this study was divided into two land cover types.

- Northern coastal scrub/Diablan coastal scrub.
- Coyote brush scrub.



## Historical Extent and Composition

Native Americans frequently burned shrublands to encourage grass and forb development as dense scrub or chaparral had little value to them (Keeley 2002). A fire-return interval of more than once or twice per decade is detrimental to non-sprouting shrubs such as most *Ceanothus* and *Arctostaphylos* species and tends to promote the reduction of shrublands in favor of grasslands (Keeley 2002). With the Spanish and Mexican settlement, most of the burning by native Americans stopped and fire frequency declined (Greenlee and Langenheim 1990); however, ranchers still burned chaparral areas to expand the prairie for pasture (Greenlee and Langenheim 1990). With the influx of people from the Gold Rush of 1849, rangelands became crowded and settlers increased the conversion of shrublands to nonnative grasslands (Keeley 2004). The historic extent and composition of shrublands in the study area is unknown. However, the fact that chaparral and shrublands are so common today suggests that the study area may not have seen the type conversion of chaparral to grassland experienced in other parts of California.

## Common Wildlife Associations

Common wildlife species that use chaparral and scrub habitats in the study area include gopher snake (*Pituophis melanoleucus*), western rattlesnake, western fence lizard, brush rabbit (*Sylvilagus bachmani*), California pocket mouse (*Perognathus californicus*), Botta's pocket gopher, California ground squirrel, spotted skunk (*Spilogale gracilis*), mule deer, coyote, and bobcat (*Lynx rufus*). Common bird species include mourning dove (*Zenaida macroura*), California quail (*Callipepla californica*), Anna's hummingbird (*Calypte anna*), western scrub-jay, Bewick's wren (*Thryomanes bewickii*), California towhee (*Pipilo crissalis*), lesser goldfinch (*Carduelis psaltria*), fox sparrow (*Passerella iliaca*), white-crowned sparrow (*Zonotrichia leucophrys*), and dark-eyed junco (*Junco hyemalis*).

## Chaparral and Northern Coastal Scrub Land Cover Types

### Northern Mixed Chaparral/Chamise Chaparral

*Northern mixed chaparral/chamise chaparral* is classified by Holland (1986) as "broad-leaved sclerophyll shrubs, 2–4m tall, forming dense, often nearly impenetrable vegetation...[with] usually little or no understory vegetation [and] often considerable accumulation of leaf litter." Northern mixed chaparral/chamise chaparral appeared darker green in color than other chaparral types in all seasons, and frequently occupied larger areas. Chamise chaparral was originally split into a separate land cover type but could not be distinguished on the aerial photograph from northern mixed chaparral.

Dominant shrubs in this community in the study area are chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos* spp.), scrub oak (*Quercus berberidifolia*), and ceanothus (*Ceanothus* spp.). Other important species are

toyon (*Heteromeles arbutifolia*), coffeeberry (*Frangula [Rhamnus] californica*), madrone (*Arbutus menziesii*), California bay (*Umbellularia californica*), birchleaf mountain-mahogany (*Cercocarpus betuloides*), poison-oak (*Toxicodendron diversilobum*), bush monkey flower (*Mimulus aurantiacus*), and California yerba santa (*Eriodictyon californicum*). Some chaparral stands may be almost entirely composed of dense stands of chamise (Holland 1986). Northern mixed chaparral/chamise chaparral in the study area includes the following shrubland associations based on quantitative vegetation sampling conducted by the CNPS along extensive areas of Coyote Ridge (Evens and San 2004):

- **Chamise (pure) shrubland association.** Chamise is the dominant species in this association of dense shrubs<sup>15</sup> that generally occurs on extremely dry sites on south-facing, moderately steep to steep slopes. The herbaceous component is minor and sometimes absent in this association. Additional species which may have sparse representation are black sage (*Salvia mellifera*), coast live oak (*Quercus agrifolia*), wild mustard (*Hirschfeldia incana*), toyon, California cudweed (*Pseudognaphalium [Gnaphalium] californicum*), Napa star thistle (*Centaurea melitensis*), coyote brush (*Baccharis pilularis*), buck brush (*Ceanothus cuneatus*), California yerba santa, and silk tassel species (*Garrya* spp.).
- **Chamise-bigberry manzanita-bush monkey flower shrubland association.** This association of open to dense shrubs can be found on both serpentine and non-serpentine soils. The understory herbaceous layer is a small component of the community and is relatively open. The dominant shrubs are chamise and bigberry manzanita. Bush monkey flower and redberry buckthorn (*Rhamnus crocea*) are present in this shrubland. Other species that sometimes are present in this association are Torrey's melicgrass, California sagebrush, woolly-fruited lomatium (*Lomatium dasycarpum*), chaparral silk tassel (*Garrya congdonii*), hounds tongue (*Cynoglossum grande*), wavyleaf soap plant, coyote brush, scarlet pimpernel (*Anagallis arvensis*), and shiver grass.
- **Chamise-black sage (pure) shrubland association.** This association features chamise and black sage as co-dominants on south-facing slopes. Bigberry manzanita is present with lower coverage. There may also be a small open hardwood overstory component and herbaceous layer. Other species which may be present but sparse are slender wild oats, lichen, small-flowered needlegrass, California sagebrush, ceanothus species and coast live oak.
- **Bigberry manzanita-mixed (California sagebrush-black sage) shrubland association.** This mixed shrubland is found on serpentine and non-serpentine soils. Bigberry manzanita is dominant in a layer of somewhat openly spaced to more densely packed shrubs. There is an herbaceous understory layer and a small tree layer comprising conifers and hardwoods. Additional shrubs that may be found are California sagebrush, black sage, and less frequently chamise. Grasses commonly present are small-flowered

<sup>15</sup> On Coyote Ridge, chamise has an absolute cover of 50–60% (Evens and San 2004).

needlegrass, foxtail chess, slender wild oats, and Italian ryegrass. Coast live oak and foothill pine (*Pinus sabiniana*) may be present in the overstory.

- **Coyote brush/annual grass shrubland association.** This association consists of coyote brush, which is dominant in an open canopy, and a continuous herbaceous understory composed primarily of grasses with wild oats as the dominant. Additional grasses include ripgut brome, soft chess, Italian ryegrass, foxtail chess, and purple needlegrass. Other herbaceous elements include turkey mullein (*Croton [Eremocarpus] setigerus*), yellow star thistle, common yarrow, bull thistle (*Cirsium vulgare*), Kellogg's yampah (*Perideridia kelloggii*), California cudweed, gumweed (*Grindelia* spp.), hayfield tarweed, wild mustard, and wavyleaf soap plant.
- **Coyote brush-California sagebrush-toyon shrubland association.** This association occurs both on serpentine and non-serpentine soils generally on southeast- to southwest-facing slopes. The shrub layer can be more openly spaced or have denser coverage (30–80% on Coyote Ridge) and has an open herbaceous understory layer. Coyote brush is the dominant shrub, with toyon, California sagebrush, and bush monkey flower as associates. Other characteristic species are moss and California cudweed. Also frequently present are lichen, foxtail chess, and California figwort (*Scrophularia californica*). Black sage, deerweed (*Acmispon glaber [Lotus scoparius]*), and nit grass are less frequently encountered in this association.
- **Birchleaf mountain mahogany-chamise-bush monkey flower association.** This is a mixed shrub association with open cover (30% on Coyote Ridge). Birchleaf mountain mahogany, chamise, and bush monkey flower are dominants. The herbaceous layer is open and is composed primarily of Torrey's melic grass. An open hardwood layer may also be present. Other species that may be present in small numbers are hollyleaf cherry (*Prunus ilicifolia*), poison-oak, bedstraw (*Galium* spp.), sticky cinquefoil (*Drymocallis [Potentilla] glandulosa*), goldenback fern (*Pentagramma triangularis*), common yarrow, nit grass, purple sanicle (*Sanicula bipinnatifida*), foxtail chess, shiver grass, and Spanish broom (*Spartium junceum*).

Northern mixed chaparral/chamise chaparral occupies an estimated 23,763 acres (5.2%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is found in the northeastern part of the study area in the Western Diablo and Diablo Ranges (**Figure 3-10**). It is also found in the central western portion of the study area. Northern mixed chaparral may intermingle with northern coastal scrub/Diablan sage scrub, foothill pine and oak woodlands, and mixed oak woodland and forest.

The covered plant that may be found on this land cover type is Loma Prieta hoita (*Hoita strobilina*), which grows in loose talus in chaparral (**Table 3-6**). Several wildlife species may be found in this land cover type as well. Given the presence of adjacent aquatic habitat, California tiger salamander, California red-legged frog and western pond turtle may use northern mixed chaparral/chamise chaparral as movement, avestation, or foraging habitat (**Table 3-5**).

### Mixed Serpentine Chaparral

*Mixed serpentine chaparral* consists of fire-adapted shrubs found on serpentine soils (California Partners in Flight 2004). Serpentine chaparral is generally more open than other chaparral types and shrubs tend to be shorter and have leaves which are reduced, curled, or thickened (Hanes 1988; California Partners in Flight 2004). Species present in mixed serpentine chaparral with a high affinity for serpentine are coyote ceanothus, *Calistoga navarretia* (*Navarretia heterodoxa*), Santa Clara Valley dudleya, Mt. Hamilton thistle, smooth lessingia, and Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*).

Mixed serpentine chaparral in the study area includes the following associations based on quantitative vegetation sampling on Coyote Ridge (Evens and San 2004):

- **Bigberry manzanita/Torrey's melic grass shrubland association.** This association is found on serpentine soils with bigberry manzanita as the dominant shrub in an open shrub layer. Species that follow in dominance are Torrey's melic grass and soft brome. Other species that may be present in the understory are foxtail chess, small fescue, Italian ryegrass, slender wild oats, California sagebrush, and leather oak. Less frequently encountered species are purple needlegrass, toyon, rat-tail fescue, dwarf plantain, one-sided bluegrass, and ripgut brome.
- **Hollyleaf cherry-poison-oak/grass shrubland association.** The dominant shrub in this open serpentine shrub association is hollyleaf cherry. Coast live oak and valley oak (*Quercus lobata*) are often present in the overstory. Scrub oak and poison-oak are ubiquitous but in low cover. Other commonly associated shrubs with higher cover are bush monkey flower, bigberry manzanita, and California sagebrush. The most common species in the herbaceous layer, which is scattered to more frequent in coverage, include Italian ryegrass and soft brome. Foxtail chess, slender wild oats, wild mustard, Napa star thistle, phlox-leaved bedstraw (*Galium andrewsii*), Torrey's melic grass, ripgut brome, and common yarrow may also be present.
- **Leather oak-bigberry manzanita-chaparral silktassel/Torrey's melic grass shrubland.** This association occurs on north-facing rocky slopes on serpentine parent material. It has also been documented on talus deposits in the Mt. Hamilton Range. Leather oak is the dominant species in the shrub layer, which tends to be open to more continuously present (30–78% cover on Coyote Ridge). Bigberry manzanita and chaparral silktassel are also characteristic, with the former sometimes occurring as a co-dominant with leather oak. Other shrubs sporadically but frequently present are redberry buckthorn, poison-oak, toyon, hoary coffeeberry, hollyleaf cherry, and birchleaf mountain mohagany. The hardwood overstory tree layer may include scattered coast live oak.
- **Leather oak-bigberry manzanita-coast sagebrush/grass shrubland.** This serpentine shrubland association can be found on all aspects. Leather oak and bigberry manzanita are co-dominants in a shrub layer that is open to more continuously present (12–45%). California sagebrush has the third greatest shrub coverage in the association. In the herb layer, Torrey's melic

grass, slender wild oat, and soft brome are characteristic species. Other grasses and herbs that may be present are Italian ryegrass, ripgut grass, foxtail chess, small-flowered needlegrass, poison-oak, California poppy, scrub oak, and hayfield tarweed. Santa Clara Valley dudleya may occur on rock outcrops within this association.

- **Leather oak-toyon-California bay shrubland association.** This association is found on north-facing slopes on serpentine parent material. The shrub layer is discontinuous to continuous and is dominated by leather oak. Poison-oak, bigberry manzanita, and toyon are subdominant but can be dominant in certain stands. This association is also characterized by an emergent layer of California bay. Additional characteristic shrubs are hoary coffeeberry, birchleaf mountain mahogany, bush monkey flower, California gooseberry (*Ribes californicum*), chaparral mallow (*Malacothamnus fasciculatus*), and blue elderberry (*Sambucus nigra* ssp. *caerulea* [*S. mexicana*]). Torrey's melic grass, soft brome, Italian ryegrass, and reddened clarkia (*Clarkia rubicunda*) are often present in low cover.
- **Hoary coffeeberry-Mt. Hamilton thistle-seep monkey flower shrubland.** This association occurs on northwest- and southwest-facing slopes in wetlands and seeps on serpentine soils. The shrub layer is open to more continuous with hoary coffeeberry as the dominant shrub. Italian ryegrass dominates a semi-continuous herbaceous layer but Mt. Hamilton thistle, seep monkey flower, hayfield tarweed, and common yarrow are also characteristic. Barley species (*Hordeum* spp.), bentgrass, irisleaf rush, and California poppy are frequently encountered as well.

Associations that occur both in serpentine and non-serpentine soils and are described above under *northern mixed chaparral/chamise chaparral* include

- **Chamise-bigberry manzanita-monkey flower shrubland association.**
- **Bigberry manzanita-mixed (California sagebrush-black sage) shrubland association.**
- **Coyote brush-California sagebrush-toyon shrubland association.** Coyote ceanothus is often present when this association occurs on serpentine soils.

Mixed serpentine chaparral occupies an estimated 3,712 acres (0.8%) of the study area (**Table 3-7** and **Figure 3-10**). Mixed serpentine chaparral is found east of U.S. 101 in the small canyons along Coyote Ridge and in small patches at higher elevations mostly in Henry W. Coe State Park. Small patches are also found on either side of Highway 152 near Pacheco Peak, in the upper Llagas Creek watershed, and in the vicinity of Anderson Reservoir and Dam. Mixed serpentine chaparral is most abundant (although never common) in the Santa Cruz Mountains south of Calero Reservoir and west of Morgan Hill.

Covered plants that may be found on this land cover type include, coyote ceanothus, Loma Prieta hoita, and most beautiful jewel-flower (**Table 3-6**). Several covered wildlife species may be found in this land cover type as well. Given the presence of adjacent aquatic habitat, California tiger salamander, California red-legged frog and western pond turtle may use mixed serpentine

chaparral as movement, aestivation, or foraging habitat. Bay checkerspot butterfly uses mixed serpentine chaparral as movement habitat (**Table 3-5**).

### **Northern Coastal Scrub/Diablan Coastal Scrub**

*Northern coastal scrub/Diablan coastal scrub* is composed primarily of evergreen shrubs with an herbaceous understory in openings. This land cover type is usually found at elevations below 300 feet (California Partners in Flight 2004).

On aerial photographs, Northern Coastal Scrub appeared a distinctive shade of pale turquoise-green in summer images and pale tan in fall and winter images; this land cover type typically occurs on south facing slopes, often in relatively small stands interspersed with annual grassland and oak woodland.

Northern coastal scrub/Diablan coastal scrub communities are dominated by California sagebrush and black sage, with associated species including coyote brush, California buckwheat (*Eriogonum fasciculatum*), poison-oak, and bush monkey flower (Holland 1986). Northern coastal scrub/Diablan coastal scrub occurs on both serpentine and non-serpentine substrate; however Northern coastal scrub that occurred on mapped serpentine soils was mapped as serpentine chaparral. The dominant woody plants in this land cover type are nearly the same among different soil types. Northern coastal scrub/Diablan coastal scrub in the study area includes the following vegetation associations based on quantitative vegetation sampling conducted on Coyote Ridge (Evens and San 2004).

- **California sagebrush-coyote ceanothus shrubland.** This association is found on serpentine and on the edges of serpentine on non-marine sedimentary substrate. California sagebrush and coyote ceanothus dominate the sparse shrub layer. Foothill pine is found in the sparse conifer tree layer. Toyon is also common. California yerba santa, Torrey's melic grass, bigberry manzanita, slender wild oats, coyote brush, small-flowered needlegrass, Napa star thistle, common yarrow, woolly-fruited lomatium, hoary coffeeberry, California bee-plant, blue elderberry, and lichen may be present in low amounts. Coyote ceanothus has a strong affinity for serpentine substrates.
- **California sagebrush/California poppy-grass shrubland.** This association is found on serpentine and on the edges of serpentine (on non-marine sedimentary substrate). California sage is the dominant shrub in a relatively open shrub layer (5–45% cover on Coyote Ridge). Slender wild oat, foxtail brome, California poppy, soft brome, and purple needlegrass are common associates. Common yarrow, Santa Clara Valley dudleya, nude buckwheat, Torrey's melic grass, Italian ryegrass, woolly-fruited lomatium, small-flowered needlegrass, Napa star thistle, and blue dicks may also be present.
- **California sagebrush-black sage shrubland.** This association, characterized by California sagebrush and black sage, is also found on serpentine and diabase. The shrub layer is relatively open (30–40% cover on Coyote Ridge) and the herbaceous layer is a minor component. Species

present include bigberry manzanita, coyote brush, toyon, foxtail brome, chaparral mallow, bush monkey flower, and coast live oak.

- **Black sage (pure) shrubland association.** This association occurs on serpentine on northwest- and southwest-facing slopes. Black sage forms a sparse to relatively dense cover of shrubs (average 54% cover on Coyote Ridge). California sage may be present at very low cover. The herbaceous layer is almost non-existent. Other species occasionally encountered are coast live oak, chamise, bigberry manzanita, blue elderberry, poison-oak, Napa star thistle, and scarlet pimpernel.

Northern coastal scrub/Diablan coastal scrub occupies an estimated 10,306 acres (2.2%) of the study area scattered throughout the Santa Cruz Mountains and Diablo Range (**Table 3-7** and **Figure 3-10**).

Covered plants that may be found on this land cover type fragrant fritillary, and most beautiful jewel-flower (**Table 3-6**). Several wildlife species may be found in this land cover type as well. Given the presence of adjacent aquatic habitat, California tiger salamander, California red-legged frog and western pond turtle may use northern coastal scrub/diablan coastal scrub as movement, upland, or foraging habitat (**Table 3-5**).

### **Coyote Brush Scrub**

*Coyote brush scrub* is a type of northern coastal scrub dominated by coyote brush. Common associated shrub species in Santa Clara County include California sagebrush, California lilac (*Ceanothus* spp.), lupine species, bush monkey flower, hoary coffeeberry, and poison-oak. This land cover type is generally found on windy, exposed sites with shallow, rocky soils (Holland 1986); it also occurs on river terraces. Typically it represents the first stage (and least mature in terms of composition development) of scrub occupation of former grassland sites in the succession stage described above (Ford and Hayes 2007). Coyote brush scrub occupies an estimated 180 acres (0.04%) of the study area (**Table 3-7** and **Figure 3-10**). In the study area, it is found adjacent to a few riparian areas and on mid-slopes in the northeastern portion of the study area.

Several wildlife species may be found in this land cover type. Given the presence of adjacent aquatic habitat, California tiger salamander, California red-legged frog and western pond turtle may use northern mixed chaparral/chamise chaparral as movement, upland, or foraging habitat. Bay checkerspot butterfly uses this land cover as movement habitat (**Table 3-5**).

## **Ecosystem Functions**

### **Function and Integrity**

Northern coastal scrub/Diablan sage scrub and coyote brush scrub intermingle with California annual grassland, northern mixed chaparral/chamise chaparral, coastal prairie (grassland), and mixed evergreen forest (Ford and Hayes 2007) and serve as an important corridor for wildlife. In addition, small mammals tend to forage on grassland species that are close to shrub canopies because they

afford greater protection (Keeley 2000). Because sage scrub species are less woody than chaparral species and tend to direct their energy to leaf growth, the structure of coastal scrub communities tends to be open with an herbaceous ground layer (California Partners in Flight 2004). This open structure is important to the white-crowned sparrow (*Zonotrichia leucophrys nuttalli* and *Z. l. pugetensis*) and the sage sparrow (*Amphispiza belli*). The Allen's hummingbird (*Selasphorus sasin*) and the orange-crowned warbler (*Vermivora celata lutescens*) are also associated with this land cover type. The leaves of sage scrub contain important nutrients for herbivorous insects, more so than northern mixed chaparral/chamise chaparral. Peak leaf nutrient levels in scrub appear to coincide with the height of bird breeding season and may be an important food source (California Partners in Flight 2004). California sage and black sage, members of both northern coastal scrub/Diablan sage scrub and northern mixed chaparral/chamise chaparral communities, are important food resources for small mammals, reptiles, and bird species. In addition, both communities have a relatively low proportion of nonnative species due to dense shrub canopies, soil types, and dry conditions, and thus are important resources to wildlife.

The fire-following forbs associated with northern mixed chaparral/chamise chaparral are abundant for one or more years after a fire and provide high-quality habitats for a diversity of insects and other wildlife. The unique flora of post-fire chaparral contributes to its trait of supporting the highest concentration of special-status plants of any community in California (California Native Plant Society 2001). Many species that inhabit chaparral also inhabit adjacent grassland and oak woodlands; however, some birds and mammals are found largely in the dense cover and shade of mature chaparral stands.

### Natural Disturbance

Many of the plants in the chaparral and northern coastal scrub communities have evolved to be dependent on periodic fire for regeneration (Holland 1986; Hanes 1988; Schoenherr 1992). In fact, communities dominated entirely by chamise cannot sustain themselves in the absence of fire (U.S. Fish and Wildlife Service 2002). Some species of chaparral have peeling bark or volatile oils that promote fire (Schoenherr 1992). Many of the dominant shrubs, such as manzanita and ceanothus, have adapted to fire by resprouting from basal burls or woody root crowns following a fire event. Other species have seeds that require fire to initiate growth (U.S. Fish and Wildlife Service 2002; Rundel and Gustavson 2005). Regrowth is triggered by removal of the overstory, typically by fire. Chemicals in smoke and charred wood also stimulate germination in a wide variety of native forbs that lie dormant as seeds in the soil for decades before a fire. Fire occurrence that is too frequent, however, can lead to the elimination of these communities altogether and promote annual grassland succession.

Ford and Hayes (2007) described the dynamic successional relationship between California grasslands and northern coastal scrub. Frequent fire, rodent herbivory, livestock grazing and trampling, and drought tend to maintain grassland and limit succession from grassland to northern coastal scrub as well as the succession from scrub to mixed oak woodland. The succession from grassland to scrub can be as rapid as >5% per year after suppression of fires and livestock grazing, and the succession from scrub to woodland can occur within 50 years after that.



Returning such sites to grassland would typically require management that included manual clearing and herbicides or repeated burning at times of maximum herbaceous understory and dry weather, followed by at least moderate intensity summer seasonal or year-long livestock grazing.

### Threats

Threats to chaparral and northern coastal scrub include habitat fragmentation and loss due to urbanization, fire suppression, competition, and/or hybridization with nonnative plants, trampling, and natural events (U.S. Fish and Wildlife Service 2002).

Fire-suppression policies and growth of human habitation in chaparral and shrub communities pose a great threat to these communities. With buildup of fuel over many years, the risk of catastrophic fire is greatly increased (U.S. Fish and Wildlife Service 2002). Such a fire can kill threatened and endangered wildlife, which might otherwise be able to escape. Severe topsoil erosion is also a problem after these intense fires (Schoenherr 1992). Native serpentine chaparral is threatened by air pollution and resultant nitrogen deposition. Nitrogen enrichment fosters the invasion of nonnative species that replace native ones (Weiss 1999).

## Oak Woodland

The most common land cover types in the study area are dominated by upland hardwood trees, usually various species of oaks (*Quercus* sp.). These land cover types were defined as part of the *oak woodland* natural community, an upland tree-dominated community with at least 10% cover of hardwood tree species. The oak-dominated land cover types that occur in the study area are listed below.

- Valley oak woodland.
- Mixed oak woodland and forest.
- Coast live oak woodland and forest.
- Blue oak woodland.
- Foothill pine-oak woodland.
- Mixed evergreen forest.

CDFG considers valley oak woodland and blue oak woodland sensitive biotic communities (California Department of Fish and Game 2007).

### Historical Extent and Composition

Oak woodland land cover types were historically more extensive and less fragmented relative to current conditions. The deep alluvial soils found throughout the lowland areas of the Santa Clara Valley formerly supported a wide range of oak forests and woodlands. Historical photos, maps, and

observational accounts indicate that large areas of the Santa Clara Valley within the Coyote Watershed were dominated by Valley oak woodland, all of which has been converted to urban development and agricultural uses (Grossinger et al. 2006).

Native Americans and European settlers manipulated local oak woodlands, through burning, grazing, and planting, to serve their needs. Large shifts in the composition and function of oak woodland communities began with the gold rush and increased in the latter part of the 20<sup>th</sup> century when previously grazed oak woodlands were converted to rural residential parcels leading to a decline in abundance and distribution of these oak communities (Pavlik et al. 1991). Recent studies show that the median parcel size in parts of California once dominated by oaks has decreased exponentially, from 550 acres in 1957 to just nine acres in 2001. As a result, the urban interface with oak woodlands is much more pervasive than at any other time in history (Giusti et al. 2004).

## Common Wildlife Associations

Oak woodlands provide food and cover for many species of wildlife (County of Santa Clara 2005). Mature oak trees bear natural cavities, which are important resources for cavity-nesting birds and small mammals. Also, mature oak forests typically contain snags (standing dead trees), which are valuable resources for woodpeckers because they prefer dead trees and limbs for excavation of roost and nest sites (Thomas 1961). Snags receive high levels of use by secondary cavity-nesting birds (e.g., chickadees and wrens) and mammals. Snags also support wood-boring insects that provide food for bark-gleaning insectivorous birds. Oak forests also provide acorns, which as a seasonal food are important for the survival of many species of wildlife in fall and winter. Birds that are dependent on acorns as a seasonal food include acorn woodpeckers, scrub-jays, band-tailed pigeons, and California quail.

Characteristic wildlife species that can be found in these land cover types include amphibian species such as California red-legged frog and California tiger salamander that use these habitat types for summer aestivation and movement when aquatic habitats are present; reptile species such as gopher snake and western fence lizard; bird species such as red-tailed hawk, American kestrel, barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker (*Picoides nuttallii*), northern flicker (*Colaptes auratus*), white-breasted nuthatch (*Sitta carolinensis*), California quail, spotted towhee (*Pipilo maculatus*), Bewick's wren, and bushtit (*Psaltiriparus minimus*); and mammal species such as deer mouse (*Peromyscus maniculatus*), western gray squirrel (*Sciurus griseus*), mule deer, and coyote (County of Santa Clara 2005).

Oak woodland-associated wildlife species covered by the Plan include Bay checkerspot butterfly, California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird, and San Joaquin kit fox (**Table 3-5**).

California tiger salamanders use the grassy understory of open woodlands for terrestrial aestivation or refuge and aquatic sites for breeding. The California red-legged frog uses this habitat type for breeding, foraging, and refugia. The western pond turtle utilizes aquatic habitat often found in oak woodlands. The turtle is known to overwinter in leaf litter or soil at upland sites. San Joaquin kit foxes may use this community for movement through the study area. The western burrowing owl uses open woodlands, with low-stature vegetation for foraging and burrowing. Bay checkerspot butterfly may use this community for movement between habitat patches.

## Oak Woodland Land Cover Types

The six different oak woodland land cover types mapped showed quite different signatures on aerial photographs, in terms of color and texture, and each typically occupied different landscape positions.

### Valley Oak Woodland

Valley oak woodland was distinguished by a combination of crown size and spacing and landscape position. In the Plan study area, valley oak tree crowns are typically larger than any other oak species except some blue oaks, and are typically well-spaced; valley oak woodland is almost always adjacent to annual grassland and either mixed oak or blue oak woodland types.

Although valley oak is typically found in alluvial soils in California, it also occurs in nonalluvial sites on broad ridgetops and mid-slope benches. *Valley oak woodland* is characterized by a fairly open canopy of mature valley oaks with a grassy understory, generally on valley bottoms and north-facing slopes (Griffin 1971; Holland 1986; Sawyer and Keeler-Wolf 1995). Valley oak woodlands often form a mosaic with annual grasslands, and are also found adjacent to other land cover types, including mixed oak woodland, blue oak woodland, and riparian woodland types. Valley oak woodland is generally denser on valley bottoms where the tree roots can penetrate to the groundwater, and less dense on ridges where trees need wider spacing to develop larger root systems (Griffin 1973).

Trees in the valley oak community are typically mature and well spaced. They are usually the only trees present in this open-canopy woodland, have no shrub layer, and the understory is dominated by nonnative annual grasses. As with most oak communities, regeneration typically is episodic, occurring periodically in “mast years” when acorn production is high and some acorns germinate by avoiding acorn predators such as acorn woodpeckers and California ground squirrels. Creeping wild rye, poison-oak, mugwort (*Artemisia douglasiana*), and California rose (*Rosa californica*) are common native species in riparian portions of valley oak woodland.

Covered plants that may be found within the valley oak woodland include Santa Clara Valley dudleya, fragrant fritillary, and Loma Prieta hoita (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within this land cover. Valley oak woodland occupies

approximately 12,895 acres (2.8%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is most common on the valley floors of the southeast corner of the study area, but it also occurs on ridgetops in the central eastern portion of the study area.

### **Mixed Oak Woodland and Forest**

The *mixed oak woodland and forest* land cover type is a significant land cover type in the study area. It contains oak woodland habitats where no species is clearly dominant, or where different types of oak woodlands are present in a small-scale mosaic and each type occurs in patches too small to map. It includes a mixture of live and deciduous oaks; foothill pine may be present as scattered individuals.

Mixed oak woodland and forest in the Plan study area is generally a closed-canopy woodland, with the signature on aerial photographs showing a variety of colors and textures of the different oak species; winter images clearly show that deciduous and evergreen oaks are mixed. This land cover type occurred on a variety of aspects and slope positions, and was typically adjacent to other oak woodland types.

Covered plants that may be found within mixed oak woodland and forest include Santa Clara Valley dudleya, fragrant fritillary, and Loma Prieta hoita (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within this land cover. Mixed oak woodland and forest occupies approximately 84,488 acres, (18.4%) of the study area (**Table 3-7** and **Figure 3-10**). It is found predominantly at middle elevations in the foothills of the Diablo and Santa Cruz Mountains on either side of Santa Clara Valley. It is, taxonomically, the broadest and most geographically widespread of the oak woodland land cover types in the study area. It was mapped in most areas within the study area where oaks are found, with the exception of an eastern portion of the study area where foothill pine-oak woodland is dominant.

### **Coast Live Oak Woodland and Forest**

The *coast live oak woodland and forest* land cover type mostly includes stands of coast live oak, although California bay is often a major component, and other live oaks and scattered deciduous trees are often present.

Coast live oak woodland and forest was identified by its closed canopy and even dark green color that was the same in all seasons, and by its landscape position, occurring generally on north-facing valley slopes and valley bottoms. There was often an abrupt transition between annual grassland and coast live oak woodland, with coast live oak woodland occupying valley slopes and annual grassland occurring on the surrounding ridges. Coast live oak woodland also occurred adjacent to other oak woodland types.

Grasses and herbs are common in this land cover type. Other species found in this cover type include coffeeberry, bush monkey flower, redberry buckthorn, and California sagebrush (Allen-Diaz et al. 1999). In addition, California blackberry (*Rubus ursinus*), bugle hedge nettle (*Stachys ajugoides*), wood fern (*Dryopteris arguta*), and poison-oak are often present.

Across the Central Coast Ranges, stands occur at lower elevations (200–3,250 feet, mean 1,205 feet) on north and northeast aspects. Slopes are generally steep (36% on average), and parent material is primarily sedimentary sandstone and shale, with loam soils (Allen-Diaz et al. 1999).

Covered plants that may be found within coast live oak forest and woodland include Santa Clara Valley dudleya, fragrant fritillary, and Loma Prieta hoita (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within this land cover.

Coast live oak woodland and forest occupies approximately 31,652 acres of the study area (6.9%) of the study area (**Table 3-7** and **Figure 3-10**).

### **Blue Oak Woodland**

*Blue oak woodland* is highly variable in the study area, occurring as single-species canopy stands with virtually no shrub layer understory or with a shrub layer of California sage, as open-canopy stands of widely spaced, mature trees on broad ridges, and as more mixed overstory stands with a dense and diverse shrub understory.

Blue oak woodland was identified by the color of the canopy: pale to mid green in summer imagery in contrast to coast live oak, and leafless in winter imagery. The canopy of blue oak woodland could be closed or relatively open. Aspect was important in distinguishing blue oaks from other deciduous oak species: blue oak woodland in the study area typically occurred on south-facing aspects; however, ridge-top stands of large, well-spaced blue oaks also occurred, and could be difficult to distinguish from valley oaks.

Blue oak woodland is dominated by blue oak (*Quercus douglasii*), a highly drought-tolerant species adapted to growth on thin soils in the dry foothills. Blue oaks grow slowly in these soils and may take decades to reach maturity. They generally occur on sites that are drier and have lower levels of nitrogen, phosphorus, and organic matter than those where valley oak or coast live oak are found (Griffin 1973; Baker et al. 1981). Although blue oaks can become established on south-facing slopes during wetter years or where mesic conditions are present, they are generally found on north-facing slopes (Griffin 1971). However, in the Central California Coast Ranges, blue oak woodland is more common on south-facing slopes (Miles and Goudey 1997). California buckeye and foothill pine are associate tree species in this community.

The understory varies from shrubby to open, with a composition similar to that of the adjacent nonnative grassland. Understory species include annual grasses, hollyleaf cherry, poison-oak, and coffeeberry. Blue oak woodland is considered a sensitive community by CDFG (California Department of Fish and Game 2007) when the following species are present: blue oak, valley oak, and coast live oak.

Fragrant fritillary is the only covered plant that may be found within blue oak woodlands (**Table 3-6**). This species is restricted to specific habitat elements and micro-site characteristics within this land cover.

Blue oak woodland and forest occupies approximately 11,160 acres (2.4%) of the study area (**Table 3-7** and **Figure 3-10**). It is present in scattered locations mostly in the low to mid-elevation hills of the watershed on dry or well-drained north or northeast facing slopes.

### **Foothill Pine-Oak Woodland**

Foothill pine-oak woodland was identified by the obvious signatures on aerial photographs of well-spaced emergent foothill pine crowns, which appear pale gray-green with clear shadows over the lower canopy of contrasting darker green evergreen oaks. Foothill pine-oak woodland often occurred along valley floors within chaparral communities in the eastern foothills, and also occurred adjacent to other oak land cover types and on serpentine soils.

Found at elevations ranging from 200–2,100 feet, foothill pine integrates with blue oak and mixed oak woodlands at higher elevations, forming the *foothill pine-oak woodland* land cover type. Here, the canopy is dominated by emergent foothill pine with a typically dense understory of scattered shrubs, often those found in adjacent chaparral and scrub communities, and nonnative annual grasses and forbs. Oaks become more prevalent at lower elevations, often forming a closed canopy layer below the emergent pines, and the understory lacks an appreciable shrub layer. In the foothills to the east, associated canopy species include blue oak, interior live oak, coast live oak, and California buckeye (Griffin 1977). Closer to the coast, coast live oak, valley oak, blue oak, and California buckeye are typically found.

Associated shrub species include ceanothus species, bigberry manzanita, California coffeeberry, poison-oak, silver lupine (*Lupinus albifrons*), blue elderberry, California yerba santa, rock gooseberry (*Ribes quercetorum*), and California redbud (*Cercis occidentalis* [*C. orbiculata*]).

Covered plants that may be found within foothill pine-oak woodlands include fragrant fritillary and Loma Prieta hoita (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within this land cover.

Foothill pine-oak woodland occupies approximately 10,960 acres (2.4%) of the study area (**Table 3-7** and **Figure 3-10**). It is found throughout the hills of the Diablo range in the eastern pocket of the study area, interspersed with stands of blue oak.

### **Mixed Evergreen Forest**

Mixed evergreen forest was identified on aerial photographs primarily by its geographic location and aspect; it occurred on the west side of the valley usually on north-facing slopes. The closed canopy was dark green on imagery from any season, but appeared less even in texture than coast live oak woodland because of the mix of different tree species.

Dominant species in the *mixed evergreen forest* land cover type are evergreen broadleaved trees, such as California bay, madrone, tanoak (*Notholithocarpus* [*Lithocarpus*] *densiflorus*), and all three species of live oak: coast live oak, interior live oak (*Quercus wislizenii*), and canyon live oak (*Quercus chrysolepis*).

Conifers—Douglas fir (*Pseudotsuga menziesii*), Coulter pine (*Pinus coulteri*), and foothill pine—occur occasionally as scattered individuals. Deciduous species such as California buckeye and bigleaf maple (*Acer macrophyllum*) frequently occur in this land cover type. The transition between oak woodland and mixed evergreen forest land cover types in the study area is gradual and is characterized by a decrease in cover of live oaks and an increase in California bay, madrone, and tanoak.

Similar to the understory of oak woodlands, the understory of mixed evergreen forest varies from dense shrub thickets to areas dominated by sparse grass and forb cover. Water and light availability appear to be the controlling factors in determining the density of understory vegetation. Mixed evergreen forests lack drought adaptations and generally grow in more mesic habitats (Griffin 1971, 1973). North-facing slopes with well-drained, coarse soils provide ideal substrate conditions. The understory vegetation of mixed evergreen forests consists primarily of shade-tolerant species, such as toyon, poison-oak, and various species of ferns, due to low light levels underneath the canopy (Parker and Muller 1982; Marañón and Bartolome 1994).

Covered plants that may be found within mixed evergreen forest include Santa Clara Valley dudleya, fragrant fritillary, and Loma Prieta hoita (**Table 3-6**). These species are restricted to specific habitat elements and micro-site characteristics within this land cover.

Mixed evergreen forest occupies approximately 5,775 acres (1.3%) of the study area (**Table 3-7** and **Figure 3-10**). In the study area, it occurs on slopes with north and northeast aspects, almost exclusively at the western boundary of the study area, along high-elevation ridges in the Santa Cruz mountains.

## Ecosystem Functions

### Function and Integrity

Oak woodlands perform a variety of ecological functions, including nutrient cycling, water storage and transport, and wildlife habitat (Giusti et al. 2004). Oak woodlands share many of the same functions as the adjacent grassland and chaparral communities. However, the structure and food provided by the dominance of oak trees in this community distinguish it from the other natural community types. Oak woodland is one of the most biologically diverse communities in California, providing essential habitat for approximately 2,000 plant, 5,000 insect, 80 amphibian and reptile, 160 bird, and 80 mammal species (Merelender and Crawford 1998). Large acorn crops and a diverse insect fauna provide high-quality food for a wide variety of amphibians, reptiles, birds, and mammals.

Dense oak woodlands provide cool, shady refugia for wildlife during the hot, dry summer, and more sparse oak woodlands offer raptors ideal hunting perches. Open-canopy oak woodlands provide critical upland habitat for California tiger salamander, which aestivates in burrows in the grassland understory or beneath isolated oaks. These oak woodlands also provide nesting and foraging habitat for

a variety of bird species. The grassland understory provides habitat for fossorial rodents such as ground squirrels and gophers, which are prey for red-tailed hawks, coyotes, and great horned owls. Rodent burrows, in turn, provide habitat for a variety of other species, including burrowing owls.

### **Natural Disturbance**

Oak woodland is a fire-adapted ecosystem, and fire has likely played a large role in maintaining this community type in the study area. Fire creates the vegetation structure and composition typical of oak woodlands, and this natural community has experienced frequent, low-severity fires that maintain woodland or savannah conditions. In the absence of fire, the low or open understory that characterizes the land cover type is lost. Ultimately, closed-canopy oak forests are replaced by shade-tolerant species because oaks cannot regenerate and compete in a shaded understory. Soil drought may also play a role in maintaining open-tree canopy in dry woodland habitat.

Grazing, including precolonial grazing by deer and elk, may also have helped to maintain a more open understory that favors oaks and grasses.

### **Threats**

The two main processes influencing the prevalence of oak woodlands in California are land conversion (for development and intensive agriculture) and the parcelization of large blocks of contiguous habitat for urban development (Giusti et al. 2004).

A lack of oak regeneration, which may be related to development pressures, is also a serious threat for some species. Shortages of apparent regeneration are reported for stands of valley oak, blue oak, and coast live oak. Where regeneration is a problem, mature trees and seedlings are usually adequately abundant, but intermediate-sized trees and saplings are rare or uncommon, suggesting the mature trees will not be replaced (McCreary 2009). Research on the causes of this decline has yet to identify a single causal mechanism. However, potential interacting mechanisms include livestock herbivory and trampling, fire suppression, noxious weed invasion, herbivory by small mammals, and the dominance of annual grasses (over native perennial grasses) that compete with the oak seedlings for soil moisture during the critical early spring period. McCreary (2009) provides a decision-key for determining whether a stand of oaks has a regeneration problem.

Recent research on the effects of wild pigs in California showed that they can disturb up to 35–65% of the ground annually where they occur in high densities, and that they significantly reduce acorn survival (Sweitzer and Van Vuren 2002). In addition to feral pigs, a high density of invasive weeds and nonnative plants in the understory affect oak regeneration. Some studies have found browsing by deer livestock, or other large mammals to be an important factor negatively impacting recruitment (Borchert et al. 1989; Bartolome et al. 2002). Another study found that herbivory by small mammals (Tyler et al. 2002) is very detrimental to oak recruitment. Recruitment in many tree species, particularly oaks, can be highly cyclical and dependent on long-term rainfall patterns.



A more recent influence on oak woodlands is sudden oak death. The disease, first identified in 1995, has since spread to 12 counties and killed tens of thousands of oaks. Research indicates that coast live oaks and black oaks appear to be the most susceptible to this disease (Rizzo et al. 2003). Sudden oak death, caused by the pathogen *Phytophthora ramorum*, is a serious threat to oak woodlands and mixed evergreen forests in northern California. The pathogen can kill adult oaks and madrone; California bay, buckeye, and maple host the pathogen without being killed by it. Blue oak and valley oak have not shown symptoms of the pathogen. Sudden oak death has been confirmed in San Mateo, Santa Cruz, Alameda, Contra Costa, and Santa Clara Counties. It is unknown whether climatic or other factors will limit the spread of sudden oak death into the study area.

Due to the rarity and slow regeneration of some species of oak, several oak-dominated land cover types are considered sensitive communities by CDFG (Table 3-1).

Additionally, when urban land is in close proximity to these land cover types, there is a considerable reduction in habitat value. Noise, light, irrigation, and frequent disking for fire protection can substantially degrade habitat conditions. Habitat is also threatened by invasion of exotic plant species in the understory.

## Riparian Forest and Scrub

Riparian vegetation in the study area was classified into three land cover types.

- Willow riparian forests, woodlands, and scrub.
- Central California sycamore alluvial woodland.
- Mixed riparian woodland and forest.

CDFG considers central California sycamore alluvial woodland a sensitive biotic community (California Department of Fish and Game 2007).

Because stream systems are so closely tied to riparian forest and scrub land cover, the *riverine* land cover type is also discussed in this section.

## Historical Extent and Composition

From the foothills to the valley floor, riparian forest, woodland, and scrub communities surround riverine watercourses, thriving along stream banks and floodplains. While the largest and most diverse riparian forests occurred on mainstem rivers with natural levees, well-developed riparian forest and scrub was found along virtually all watercourses in central California (Katibah 1984). Historically, riparian vegetation was shaped by its proximity to streams and was maintained by seasonal flooding in the winter and spring and by summer drought. Riparian forests developed on the natural levees of river-deposited silt, lining many of the study area's drainages. Virtually all streams supported dense

vegetation from the water's edge to the outer moist-soil zone, whether or not natural levees were present. Precolonial riparian vegetation was characterized by corridors of dense, broadleaf vegetation of varying widths bounding the stream channel with widths determined by local geologic and hydrologic conditions (Katibah 1984).

With the gold rush in 1849, rapid development of some portions of California began. Riparian vegetation removal was one of the first significant losses in the natural environment. Although they are more fragmented today, these land cover types still support many plant species and a diverse collection of birds, amphibians, and mammals. Significant impacts have also resulted from the expansion of agriculture and livestock grazing, along with water diversion and flood control projects (Katibah 1984).

Historically, most of Coyote Creek along the valley floor may have been intermittent (often with isolated persistent pools) or dry during dry years and droughts while in wet years much of the stream may have been perennial. Streams draining the Diablo Range traveled overland, down the mountain slopes until reaching the valley floor where water spread out over the loose alluvial soils, percolating into the groundwater basin (Grossinger et al. 2006). Water traveled underground until reaching the main stem of Coyote Creek, where it surfaced and continued to drain through the salt marshes and into the San Francisco Bay. As land was claimed for agriculture, streams leading from the mountains were channelized into ditches to be used for drinking water and irrigation. The modern-day network of constructed drainage ditches and channels took place largely prior to 1900. Today nearly 50% of the valley floor watercourses draining into Coyote Creek are constructed channels (Grossinger et al. 2006).

The two main tributaries to the Guadalupe River, Guadalupe Creek and Los Gatos Creek, were historically connected to the Guadalupe River much as they are today. Much like the small tributaries of Coyote Creek, smaller tributaries of the Guadalupe River, such as Ross Creek, historically percolated into the valley floor but were not connected via surface flow to the Guadalupe River. Today, many of these small tributaries are now connected to the Guadalupe River via man-made channels (Oakland Museum of California n.d.). The Guadalupe River historically flowed into Guadalupe Slough but has since been redirected to Alviso Slough for navigation purposes.

As discussed above, the existing stream network was largely developed through human intervention and has been manipulated by the introduction of canals and ditches to provide additional flexibility in water supply, to increase the amount of developable land around streams, and to reduce flooding in the valley. As such, channels and ditches now cross between previously disparate riverine systems. One example of this is the Coyote-Alamitos Canal that was built to carry water from the Coyote Canal along Coyote Creek to Alamitos Creek and the Guadalupe percolation basin in the Almaden Valley (Horii 2004).

Historically, the defining feature of the Pajaro River watershed was a broad lowland basin that straddled the south Santa Clara County/north San Benito

County border. Covering 14 miles between Gilroy and Hollister, the remnants of this natural basin are now referred to as the Soap Lake floodplain. This historical basin was fed by the converging alluvial fans of Llagas Creek, Uvas/Carnadero Creek, and Pacheco Creek. As the streams left their steeper alluvial fans and converged into the basin, they tended to have less well defined channels than at present. Streamflow spread into an array of wet meadows, freshwater marshes and ponds, and willow swamps, and eventually coalesced again into a well-defined channel—the origin of the Pajaro River (San Francisco Estuary Institute 2007).

The head of the Pajaro River was originally wetlands associated with San Felipe Lake, a sag pond within the greater Soap Lake floodplain, located near Highway 152 east of Gilroy. When the Soap Lake floodplain was inundated, the lake and wetlands drained into the river. To facilitate agricultural development in the late 19<sup>th</sup> century, Miller Canal was constructed from San Felipe Lake directly to a downstream portion of the Pajaro River near its confluence with Llagas Creek, bypassing the flat, meandering wetland channel (San Francisco Estuary Institute 2007). The canal allowed for quicker spilling of the lake at a lower elevation, allowing farming around the lake. The original upper Pajaro River channel is now a shallow, seasonal ditch. Additional channelization of both Lower Llagas Creek and Cardanero (Uvas) Creek in the late 1800's eliminated much of the historic seasonal flows received by the Soap Lake Basin.

## Common Wildlife Associations

Riparian habitats provide food, water, migration and dispersal corridors, and nesting and cover habitat for numerous wildlife species (Grenfell 1988). These habitats have high value due to their limited extent and widespread use by an abundant and diverse assemblage of wildlife species.

Wildlife species that are often associated with this land cover type include amphibians such as Pacific tree frogs (*Pseudacris regilla*), California newts (*Taricha torosa*), and California slender salamander (*Batrachoseps attenuatus*); reptiles such as western aquatic garter snake (*Thamnophis couchii*) and San Francisco garter snake (*Thamnophis sirtalis tetrataenia*); birds such as Wilson's warbler (*Wilsonia pusilla*), Swainson's thrush (*Catharus ustulatus*), California yellow warbler (*Dendroica petechia brewsteri*), green heron (*Butorides striatus*), wood duck (*Aix sponsa*), spotted towhee, and red-shouldered hawk (*Buteo lineatus*); and mammals such as long-tailed weasel (*Mustela frenata*), San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), gray fox (*Urocyon cinereoargenteus*), mountain lion (*Puma concolor*), and California myotis (*Myotis californicus*).

Riverine systems, particularly healthy riverine systems, provide habitat for aquatic macroinvertebrates, which are an important food source for local and downstream populations of birds and other animals.

Bay checkerspot butterfly and California tiger salamander use riparian forest and scrub land cover as movement habitat. California red-legged frog uses riparian

habitat type for breeding, foraging, and refugia. Foothill yellow-legged frog (*Rana boylei*) and western pond turtle utilize aquatic habitat for thermoregulation, foraging, and avoidance of predators. The turtle is also known to overwinter in leaf litter or soil at upland sites and uses sparsely-vegetated upland sites for nesting. Least Bell's vireo has been found foraging in riparian areas in the southern portion of the county and may be nesting, especially when a dense shrub layer exists, although no confirmed nests have been found. Tricolored blackbird uses this land cover type as breeding and year-round habitat. San Joaquin kit fox has been known to use this land cover as movement habitat.

Loma Prieta hoita is the only covered plant associated with riparian forest and scrub land cover types (**Table 3-6**).

Riverine associated wildlife species covered under this Plan that are known to occur in the study area include Bay checkerspot butterfly (for movement), California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo (*Vireo bellii pusillus*), tricolored blackbird, and San Joaquin kit fox (**Table 3-5**).

## Riparian Forest and Scrub Land Cover Types

Within the Plan study area, riparian forest and scrub land cover types were identified primarily by their landscape position along creeks and around open water bodies. Several common riparian trees species—willows, cottonwood, and sycamore—appeared to hold their leaves after they turn color in fall, and early winter imagery clearly showed these distinctive yellow crowns, either in pure stands or mixed with the dark green canopies of coast live oak and bay in more mixed riparian woodland. The plant assemblage and width of riparian corridors found along the banks and floodplains of rivers and streams, vary. Dominant influencing factors include the steepness of the channel, the frequency of disturbance, and the hydrologic regime present.

The *riparian forest and scrub* land cover type is dominated by woody vegetation associated with permanent water sources. Riparian woodland is dominated by trees and contains an understory of shrubs and forbs. Riparian scrub is dominated by young willow trees and shrubs, typically representing an early successional stage of riparian woodland.

At the state level, riparian plant communities are considered sensitive because of habitat loss and their value to a diverse community of plant and wildlife species. Additionally, CDFG has identified them as a sensitive natural community (California Department of Fish and Game 2007).

### Willow Riparian Forests, Woodlands, and Scrub

*Willow riparian forests, woodlands, and scrub* land cover types occur in and along the margins of active channels on intermittent and perennial streams. Yellow willow (*Salix lasiandra*), red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), and narrowleaf willow (*Salix exigua*) are the dominant canopy species in this habitat. In addition, Fremont cottonwood, white alder (*Alnus*

*rhombifolia*), bigleaf maple, California sycamore (*Platanus racemosa*), and coast live oak are often found in these communities.

A range of conditions exists among the willow riparian forest, woodland, and scrub communities. Forests are typically composed of dense, mature willows integrating with central coast live oak riparian forest and white alder riparian forest on well-established stream terraces, often with scattered California sycamore trees. Woodland communities contain dense willow riparian scrub, dominated by young trees and shrubs, on young and dynamic alluvial deposits. Scrub communities typically consist of scattered willows and mulefat (*Baccharis salicifolia*) occurring in and along the margins of open sandy washes. Understory development in willow forest or scrub land cover types is controlled by canopy density.

Willow riparian forests, woodlands, and scrub occupy approximately 2,544 acres (0.6%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is associated with streams throughout the study area. Particularly large stands of this land cover types are found along the major creek and streams including Guadalupe River, Coyote Creek, Uvas Creek, Llagas Creek, Pacheco Creek, and the Pajaro River along the county line.

Willow riparian forests, woodland, and scrub provide important habitat for many covered wildlife species (**Table 3-5**). For example, this land cover type provides the primary habitat for least Bell's vireo in the study area. California red-legged frog and western pond turtle will also utilize this land cover type within the aquatic systems. The California tiger salamander moves through or forages in this land cover type.

### **Central California Sycamore Alluvial Woodland**

Central California sycamore alluvial woodland was readily identified by the large well-spaced sycamore crowns. In early winter aerial imagery the large pale branches and halo of fallen golden-yellow leaves were visible. The landscape position, on broad alluvial valley floors, was also indicative of this land cover type.

The *central California sycamore alluvial woodland* land cover type is generally present on broad floodplains and terraces along low gradient streams with deep alluvium. Areas mapped as sycamore alluvial woodland are generally open canopy woodlands dominated by California sycamore, often with white alder and willows (*Salix* spp.). Other associated species include bigleaf maple, valley oak, coast live oak, and California bay.

The understory is disturbed by winter flows, and herbaceous vegetation is typically sparse or patchy. Typically, plants such as willows, coyote brush, mulefat, California buckeye, blackberry, Italian thistle (*Carduus pycnocephalus*), poison-oak, common chickweed (*Stellaria media*) and bedstraw (*Galium aparine*) populate the stream banks.

Central California sycamore alluvial woodland occupies 367 acres (0.1%) of the study area (**Table 3-7** and **Figure 3-10**). All stands of this land cover type are

found along Coyote Creek and Pacheco Creek. Air photos and field mapping conducted by CDFG of this land cover type in 1992 identified only 17 major stands statewide occurring on 2,032 acres (Keeler-Wolf et al. 1997). Among the stands mapped by this project were three sites in the study area on Coyote Creek (40.1 acres between Ogier Ponds and Anderson Dam), Upper Coyote Creek (49.2 acres above Coyote Reservoir), and on Pacheco Creek along Highway 152 (135.4 acres). At that time, the study area supported 11% of this land cover type in the state. All stands were also quantitatively sampled by CDFG, providing a basis for a detailed description of this land cover type in California. Results from the CDFG study differ from the mapping conducted for the HCP/NCCP (225 acres vs. 374 acres<sup>16</sup>). Sycamore woodland is also found along lower Cedar Creek (a tributary to Pacheco Creek) and the North Fork of Pacheco Creek upstream of Pacheco Reservoir.

California red-legged frog and western pond turtle may be found in this land cover type year-round, while California tiger salamander and foothill yellow-legged frog may move through this land cover type (**Table 3-5**). Least Bell's vireo may forage in this land cover type.

### **Mixed Riparian Woodland and Forest**

*Mixed riparian woodland and forest* land cover types are similar to willow riparian forests and woodlands in species occurrences. They are found in and along the margins of the active channel on intermittent and perennial streams. Generally, no single species dominates the canopy, and composition varies with elevation, aspect, hydrology, and channel type. This land cover type captures much of the riparian woodland and forest in the study area and includes several associations that could not be distinguished on the aerial photographs. The major canopy species throughout the study area are California sycamore, valley oak, coast live oak, red willow, and California bay. Associated trees and shrubs include California black walnut, other species of willow, California buckeye, Fremont cottonwood, and bigleaf maple. Nonnative invasive species that may be present include giant reed (*Arundo donax*) and Himalayan blackberry (*Rubus armeniacus* [*R. discolor*]).

Covered plants that may be found within mixed riparian forest and woodlands are limited to Loma Prieta hoita (**Table 3-6**). This species is restricted to specific habitat elements and micro-site characteristics within this land cover.

Mixed riparian woodland and forest occupies approximately 3,717 acres (0.7%) of the study area (**Tables 3-7** and **Figure 3-10**). Mixed riparian is found in association with streams throughout the study area.

Covered species associated with this land cover type are the same as willow riparian forests, woodlands, and scrub (**Table 3-5**).

<sup>16</sup> Differences in results are likely due to differences in mapping techniques, differences in air photos used, and changes in environmental conditions over the 13 years between the studies.

### Riverine (Streams)

The *riverine* land cover type includes perennial, intermittent, and ephemeral watercourses characterized by a defined bed and bank. *Perennial streams* support flowing water year-round in normal rainfall years. These streams are often marked on USGS quadrangle maps with a blue line, known as *blue-line* streams. In the semi-arid Mediterranean climate of the study area with its wet and dry seasons, perennial stream flows are enhanced in the dry season through groundwater aquifer contributions, flows from shallower springs/seeps, and reservoir releases. *Intermittent (seasonal) streams* carry water through most of the wet season (November–April) and are dry through most or all of the dry season (May–October) in a normal rainfall year. More specifically, in the wet season, intermittent streamflow occurs when the water table is raised, or rejuvenated, following early season rains that fill shallow subsurface aquifers. Intermittent flows can also be considered as the ‘baseflows’ between storm events that continue on through much of the winter season. *Ephemeral streams* carry water only during or immediately following a rainfall event. The principal named waterways in the northern half of the study area (the Santa Clara Basin) are perennial due to urban runoff, reservoir releases, and/or high groundwater (Santa Clara Basin Watershed Management Initiative 2003). The principal waterways in the Pajaro River Basin have some perennial reaches due to a combination of high groundwater levels (primarily in headwater reaches of tributaries and in the Pajaro River), agricultural runoff, and releases from dams in the valley floor reaches.

The riverine land cover type is most closely associated with riparian plants (see the *Riparian Forest and Scrub* section above for discussion of riparian land cover types). The riparian plant composition and width of the riparian corridor vary depending on channel slope, magnitude and frequency of channel and overbank flows, and the frequency/duration of flooding flows that inundate the broader floodplain. Some of the riverine areas in the study area, particularly on the valley floor streams include braided stream forms with multiple channel threads and swales, intermediary channel bars, raised side channel benches (that are still actively flooded), and higher terrace sequences that may no longer be actively flooded. In such systems where there is frequent flooding, gravel bars with mulefat scrub occur as an early seral community (Santa Clara Basin Watershed Management Initiative 2003). Willows may become established in-channel in areas of sediment deposition, unless suppressed by intensive browsing by wildlife or livestock, lack of water, or high flows. Woody debris, such as fallen trees that are submerged in streams, provides good habitat and shelter for aquatic invertebrates.

Several invasive, nonnative plant species are found in riverine land covers within the study area. One of the most prevalent is giant reed, which is often found in large pure stands. Other invasive, nonnative plants potentially found in the study area include blue gum eucalyptus, acacia, fennel (*Foeniculum vulgare*), periwinkle, English ivy, French broom, black locust, Algerian ivy (*Hedera canariensis*), Cape ivy, Himalayan blackberry, weeds, curly dock (*Rumex crispus*), thistle, blackwood acacia (*Acacia melanoxylon*), tree-of-heaven (*Ailanthus altissima*), glossy privet (*Ligustrum lucidum*), fig, poison hemlock,

black mustard, black walnut, and almond (Santa Clara Basin Watershed Management Initiative 2003).

Major streams in the study area include Coyote Creek, Guadalupe River, Uvas Creek, Llagas Creek, Pajaro River, Pacheco Creek, and their various tributaries (**Figure 3-6**). Riverine habitats were not mapped as polygons but are derived from USGS and SCVWD stream data. Based on this information there are an estimated 3,032.2 miles of riverine habitat in the study area.

Wildlife species covered by this Plan that may be found living in or nearby the riverine land cover type include California tiger salamander, California red-legged frog, foothill yellow-legged frog, and western pond turtle (**Table 3-5**).

Common fish species found in the watersheds draining towards San Francisco Bay (Guadalupe River and Coyote Creek) include native species such as California roach (*Lavinia symmetricus*), hitch (*L. exilicauda*), Sacramento sucker (*Catostomus occidentalis*), threespine stickleback (*Gasterosteus aculeatus*), resident rainbow trout and anadromous steelhead (*Oncorhynchus mykiss*), prickly sculpin (*Cottus asper*), and riffle sculpin (*Cottus gulosus*), and introduced fishes such as green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), and mosquitofish (*Gambusia affinis*). Common native fish species found in the Pajaro River Watershed including Uvas, Llagas, and Pacheco Creek, include resident rainbow trout and anadromous steelhead, hitch (*Lavinia exilicauda*), California roach (*Lavinia symmetricus*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento sucker, threespine stickleback, Sacramento pikeminnow (*Ptychocheilus grandis*), riffle sculpin and prickly sculpin (J. Smith pers. comm. 2007).

Native and nonnative fish assemblages and in-stream aquatic habitat types throughout the major stream systems in the study area are shown in **Figure 3-12** and described in detail in **Appendix L**. The figure illustrates the distribution of the native fish assemblages and riverine habitat types developed for the Science Advisors report (Spencer et al. 2006) and updated by SCVWD fisheries biologist Jae Abel for the GIS layer. **Table 3-8** documents the relationship of the native fish communities to native fish.

Canals and ditches were included in the riverine land cover type due to their similar function to degraded streams and their very low acreage in the study area. Due to the nature of these man-made structures, canals and ditches are often managed for minimal vegetation to enhance the flow of water through the channels. Vegetated canals and ditches that cross serpentine areas (e.g., Coyote Ridge, Santa Teresa Hills) often support several covered species including Santa Clara Valley dudleya, most beautiful jewelflower, smooth lessingia, Mt. Hamilton thistle, and California red-legged frog. Garter snakes and some ducks use canals and ditches throughout the study area.



## Ecosystem Functions

### Function and Integrity

While riparian land cover types occupy a very small percentage of the total land cover in the study area, they are particularly important because they are among the most structurally complex and richly diverse habitat types in terms of plant and animal associations.

Riparian communities support both terrestrial and aquatic species by providing movement corridors across the landscape and both nesting and foraging habitat. They can also support high levels of invertebrate production; provide moist, cool refugia during the hot, dry summer; have moderate stream temperatures; help armor stream banks; and support the aquatic food chain by means of input of vegetative and other detritus.

Riparian areas are integrated into the working rangelands of the study area. They are typically managed in conjunction with adjacent grasslands, shrublands, and oak woodlands. They are often used by livestock for forage, shade and drinking water.

Denser canopies reduce direct solar radiation to streams and creeks, thereby lowering water temperatures and may increase habitat value for aquatic wildlife. However, algal growth, which increases aquatic insects, requires a partially open canopy for light. Differences in vegetative structure between riparian communities lead to varying effectiveness in providing these ecosystem functions. For example, riparian scrub, with its lower vegetation structure, is often less effective in reducing stream temperatures than riparian woodland. On the other hand, riparian scrub may provide better nesting and foraging habitat for migratory passerine birds that prefer the dense thicket habitat provided by scrub. Living and dead woody debris that enter the stream channel from the riparian forest provides valuable habitat benefits for native fish.

Physically, riverine systems, most notably natural streams, provide the essential conduits to convey flows, sediments, and nutrients across the watershed. Streams transport weathered minerals and eroded sediments from upper watershed source areas through intermediate watershed positions ultimately to lower watershed depositional areas or discharges beyond the watershed. While the general, and classical, characterization of watersheds into 'upper erosional', 'middle transitional', and 'lower depositional' areas may often hold true; in greater detail, all areas of the watershed can witness erosion, transport, or storage functions. Nutrients from exposed soil and decomposed organic matter are also carried downstream with the sediment, across the valley floor and finally into the estuary. Alluvial soils, high in organic content and nutrients, are excellent for agriculture. Sediment influx to estuaries helps maintain a marshland buffer along the shoreline that supports a myriad of wildlife.

Streams provide ecosystem functions and values much greater than the proportion of the landscape they occupy. Streams provide habitat for a wide array of aquatic insects that, in turn, function as food for amphibians, birds, and other insectivorous species. Perennial streams function as permanent water

sources in an otherwise dry landscape. Streams also provide movement corridors between different terrestrial communities. In this way, networks of ephemeral, seasonal, and perennial streams link chaparral/scrub, oak woodland, oak savanna, riparian woodland, and grassland habitats. These links are not only important for the movement of wildlife, but also represent the fastest means of transporting energy and nutrients through a watershed. Thus, it is through stream networks that organic matter and minerals are transported from the highlands and deposited in the lowlands.

Stream channels are modified for a variety of purposes. In the study area, stream channels are modified primarily for flood conveyance, ground water percolation, and agricultural and drinking water distribution. Canals and ditches are usually hardened structures for the transport of water for agricultural irrigation and urban and suburban uses. Earthen levees or channel walls are a common, engineered stream channel modification to protect property adjacent to streams from flooding. Most stream channel alterations, whether hardened structures like canals, or earthen structures such as some ditches and levees, are designed to convey water quickly, to either reduce evapotranspiration (water lost to the atmosphere) during transport, costs associated with water delivery, or to increase the flow, and thus the volume of runoff, that can be moved out of areas prone to flooding. Regardless of the type of modification, the result is often the same—a more linear alignment that does not allow a channel to meander as it would in its natural state. This results in higher flows and potential scour of the stream channel, in hardened structures such as canals, this scour typically occurs upstream and/or downstream of the solid infrastructure. Channel modifications and/or solid infrastructure such as canals also disconnect the stream from the floodplain, resulting in the loss of nutrient delivery upstream and increased sediment deposition downstream.

Agricultural ditches often play a key role in providing connectivity between larger open space areas, especially in urbanizing areas such as the Santa Clara Valley. Maintaining connectivity between open space patches that provide habitat supports a diversified genetic pool due to the ability of populations to disperse and co-mingle. Agriculture also often is associated with streams, canals, and ditches used for irrigation that may support riparian vegetation, trees (planted as windbreaks), and shrubs. These areas may provide habitat to songbirds, raptors, amphibians and reptiles, as well as provide a movement corridor for other species.

### **Natural Disturbance**

Riparian communities are shaped by their proximity to water and by periodic flooding that maintains the structure and composition of this land cover type. Wet-season flooding replenishes alluvial soils that are deficient in minerals and organic matter. Flooding also subjects riparian forest to frequent disturbance that benefits regeneration of certain species, including California sycamore, white alder, and black willow. Regeneration from seed appears to occur in pulses correlated with large flood events (Shanfield 1984). Additionally, trees that are damaged by flooding can resprout from the roots and trunk (Shanfield 1984).

The flowing nature of streams encourages regular mixing as water flows over rocks, tree stumps, and changes gradient. Depending on other environmental influences including temperature and dissolved oxygen levels, mixing may also trigger the hatching of larvae that will become food for fish, birds, and bats. Erosion and sedimentation processes are forms of natural and artificial disturbance in the area. Flood and drought cycles of natural streams tend to result in a mosaic of structure and composition in riparian plant communities (this mosaic may be lost in altered flow regimes downstream of reservoirs). Flooding is also a key disturbance process that has largely been eliminated from portions of the study area. For example, large flood-control projects on the Guadalupe River and Coyote Creeks have greatly reduced flooding frequency and intensity. Similarly, channelization of Llagas Creek and portions of Uvas Creek has reduced (but not eliminated) flooding in Morgan Hill and Gilroy, respectively. Flooding still occurs regularly in the Soap Lake area (lower Llagas Creek, lower Pacheco Creek, and upper Pajaro River).

### Threats

In the greater Bay Area, flood control activities, cultivated agriculture, aggregate mining, and urban development have significantly reduced the distribution of this land cover type. Riparian forest can also be severely impacted by improper grazing management. Therefore it is possible that this cover type was much more abundant prior to the onset of intensive livestock grazing. Finally, seedling establishment and growth is heavily dependent on access to surface water or shallow groundwater during the majority of the year (Sacchi and Price 1992). As such, water operations and land alterations that result in reduced stream baseflows and/or increased depth to the water table will have a significant negative effect on this land cover type. Sycamores in the study area, including those that dominate Sycamore alluvial woodland, are frequently infected by Sycamore anthracnose (*Apiognomonina veneta*), a fungal disease that affects trees throughout the state (Keeler-Wolf et al. 1997).

Livestock grazing can substantially degrade riparian woodland and scrub communities when cattle and other livestock have uncontrolled access to streams. However, modifying traditional grazing practices can protect riparian areas. Using shortened grazing periods during times of increased vulnerability (late summer and fall) can reduce damage to the vegetation, eliminate or reduce impacts to soils, and buffer the overland transport of sediments and nutrients from grazed lands into the surface water.

All riverine systems within the study area have been altered significantly by human impacts including impoundments, creation of permanent or temporary barriers to movement, water diversions, channelization, flood control projects, loss of riparian vegetation, and increased rates of sedimentation. These impacts reduce habitat complexity and habitat quality, affecting such things as pool/riffle relationships, level of dissolved oxygen, and substrate composition. Loss of riparian vegetation results in decreased shading, increased water temperatures, reduced cover, and decreased input of nutrients (Santa Clara Basin Watershed Management Initiative 2003). Trash and other pollutants that are washed into streams may degrade water quality to the point the aquatic life cannot persist.

Aquatic invertebrates, often sensitive to water quality, may die off, thus disrupting the food chain.

## Conifer Woodland

In addition to hardwood-dominated upland land cover types, conifer dominated land cover types also occur in the study area. The three conifer-dominated communities listed below occur in the study area.

- Redwood forest.
- Ponderosa pine woodland.
- Knobcone pine woodland.

## Historical Extent and Composition

Prior to European settlement, the Santa Clara Valley supported a mosaic of plant and wildlife communities. Upland regions were heavily forested with redwoods that flanked creeks and rivers as they traversed the landscape to lower elevations. Under mesic habitat conditions, pine and oak forests dotted the land (Bolton 1927, 1930). The foothill forests and woodlands were heavily thinned in the mid- to late-1800s to house and support the growing population in the region. With habitat alterations came the replacement of native plant communities with nonnative, invasive species. These new communities contain lower quality habitat for native wildlife species.

## Common Wildlife Associations

Wildlife species often found in conifer dominated upland land cover types include: birds such as acorn woodpecker, scrub-jay (*Aphelocoma californica*), California quail, golden eagle, Cooper's hawk (*Accipiter cooperii*), olive-sided flycatcher (*Contopus cooperi*), and sharp-shinned hawk (*Accipiter striatus*); amphibians such as arboreal salamanders (*Aneides* spp.), California slender salamander, and California newt; reptiles such as common king snake (*Lampropeltis getula*), garter snake (*Thamnophis* spp.), and ringneck snake (*Diadophis* spp.); and mammals such as broad-footed mole (*Scapanus latimanus*), deer mouse, western gray squirrel, gray fox, and striped skunk (*Mephitis mephitis*).

Associated wildlife species covered under this Plan that are known to occur in the study area include California tiger salamander, foothill yellow-legged frog and western pond turtle (**Table 3-5**).

California tiger salamanders use the grassy understory of open woodlands for terrestrial aestivation or refuge and aquatic sites for breeding. Foothill yellow-legged frogs and western pond turtles utilize aquatic habitat often found in

redwood forest and oak woodlands. The turtle is also known to overwinter in leaf litter or soil at upland sites.

## Conifer Woodland Land Cover Types

Coast redwood (*Sequoia sempervirens*) forests are primarily distributed in the Santa Cruz Mountains. They occur in ravines, along streamsides, and in areas that are moistened by coastal fog (Thomas 1961). At higher elevations of the Diablo Range, stands of ponderosa pine (*Pinus ponderosa*) are found. Stands of knobcone pine (*Pinus attenuata*) occur on ridgetops of the Santa Cruz Mountains at the western edge of the study area.

### Redwood Forest

Redwood forest was identified on aerial imagery by the large, irregular crown outlines formed by the whorled branches, and by the landscape position along creeks and valleys and on lower north- and east-facing slopes in the foothills on the western side of the valley. The irregular crown signatures on aerial photographs contrasted with the adjacent land cover types, usually mixed oak woodland or mixed evergreen woodland.

The *redwood forest* land cover type is dominated by an overstory of redwood with a variety of associated tree, shrub, and forb species in the understory. This land cover type is uncommon in the study area, only occurring in the Santa Cruz Mountains in the west portion of the study area along creeks and valleys, generally on north-facing slopes. Stands of redwoods are found along Uvas (Uvas Canyon County Park), Llagas, and Arthur Creeks. Most redwood forests have been logged since the second half of the nineteenth century, and most of the existing trees are stump sprouts. However, in many areas, particularly along creeks, dense cover of redwood trees has been maintained. Areas that were burnt following logging now support chaparral or oak-dominated communities. Redwood forests occur in areas that receive substantial rainfall, generally more than 35 inches per year. Common plants associated with these forests include trees such as tanoak, madrone, and California bay; the shrub layer include species such as hazelnut (*Corylus cornuta* var. *californica*), thimbleberry (*Rubus parviflorus*), and black huckleberry (*Vaccinium ovatum*). In riparian areas, California bay and bigleaf maple are common, California nutmeg (*Torreya californica*) may occur, and ferns such as sword fern (*Polystichum munitum*) often form a dense layer.

Redwood forest occupies approximately 9,628 acres (1.9%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is found in the study area exclusively in the Santa Cruz Mountains, mostly along drainages and near ridgelines.

Covered wildlife species that may be found in this land cover type California red-legged frog, foothill yellow-legged frog, and western pond turtle (**Table 3-5**).

Fragrant fritillary and Loma Prieta hoita may occur within redwood forest landcover, however, data is insufficient for the study area (**Table 3-6**). These

species would be restricted to specific habitat elements and micro-site characteristics within this land cover.

### **Ponderosa Pine Woodland**

Ponderosa pine woodland has a very restricted distribution within the Plan study area and was identified by the widely-scattered dark green crowns of individual Ponderosa pine trees, which cast long oblong shadows across the adjacent grassland.

The *Ponderosa pine woodland* type is dominated by an overstory of ponderosa pine, with oaks and oak woodland understory species as associates. This land cover type is uncommon in the study area, only occurring on three high elevation ridges in Henry W. Coe State Park—Pine Ridge, Middle Ridge, and Blue Ridge—and extending downslope into north-facing canyons and valleys. On the ridges, Ponderosa pine trees are often large and well spaced, forming very open stands over annual grassland. Regeneration is often common and many age classes are present. Associated tree species include black oak (*Quercus kelloggii*), coast live oak, and Pacific madrone. Few shrubs are present, although bigberry manzanita is common in some areas. Ponderosa pine is uncommon in the Coast Ranges; these stands are likely relicts of a wider distribution in the past when the climate was cooler.

Ponderosa pine woodland occupies approximately 419 acres (0.1%) of the study area (**Table 3-7** and **Figure 3-10**).

California tiger salamander, California red-legged frog and western pond turtle may move through this land cover type during dispersal events (**Table 3-5**).

Loma Prieta hoita may occur within ponderosa pine woodlands, however, data is insufficient for the study area (**Table 3-6**). This species would be restricted to specific habitat elements and micro-site characteristics within this land cover.

### **Knobcone Pine Woodland**

Knobcone pine woodland was identified by its geographical location on ridges in the western portion of the Plan study area and the mid-green, relatively even signature on aerial photographs contrasting with adjacent signatures of redwood forest, northern mixed chaparral, and mixed evergreen forest.

*Knobcone pine woodland* land cover types consist of dense stands of knobcone pines that regenerate following fire. This land cover type is uncommon in the study area, occurring only in the Santa Cruz Mountains on ridgetop sites, often on serpentine-derived soils. It is thought that the water-retaining properties of serpentinite, combined with the pine's ability to intercept marine fog, allow knobcone pine to persist in these locations (Vogl 1973). Knobcone pine is an obligate fire-climax species—fire is required to melt the resin that seals the cones, releasing the seed, and fire also creates the bare mineral soil required for the seeds to germinate. Stands of knobcone pine are therefore even-aged, dating back to the last stand-replacing fire. Knobcone pine is fast growing, with a relatively short lifespan of 75 to 100 years, although approximately half the trees may die by 60 years of age (Vogl 1973). Knobcone pine woodland is replaced

by chaparral at lower elevations and by conifers (redwood or Douglas fir) at higher elevations, and it may occur as a mosaic with chaparral, conifer- and oak-dominated woodlands. Although knobcone pine usually occurs as dense, monodominant stands, it can also be associated with chaparral species such as manzanitas, bush poppy (*Dendromecon rigida*), and bush chinquapin (*Chrysolepis chrysophylla* var. *minor*) that form a sparse to dense understory layer.

Knobcone pine woodland occupies an estimated 711 acres (0.1%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is found along the summit of the Santa Cruz mountains at the western edge of the study area.

Covered species do not forage and breed in this land cover type. Species that may move through this land cover type include California red-legged frog and western pond turtle (**Table 3-5**).

Fragrant fritillary and Loma Prieta hoita may occur within land cover type; however, data is insufficient for the study area (**Table 3-6**). These species would be restricted to specific habitat elements and micro-site characteristics within this land cover.

## Ecosystem Functions

### Function and Integrity

Similar to oak woodland, these forests and woodlands provide food, nesting, and cover to a variety of wildlife. However, the structure and food resources that conifer-dominated forests provide make them a valuable resource. Evergreen oaks such as coast live oak, as well as California bay, madrone, and foothill pine, provide year round shelter unlike the largely deciduous vegetation of riparian forest and scrub. A largely continuous, dense leaf canopy and abundant tree cavities act to shade wildlife, provide habitat for nesting, and offer protection from predators. In addition, thick layers of leaf litter, ephemeral ponds, and wetlands can provide secondary habitat for soil invertebrates and amphibians by offering protection from desiccation and foraging habitat.

### Natural Disturbance

A major factor influencing the distribution of conifer-dominated land cover types is fire intensity and frequency. The combination of logging and burning at the end of the nineteenth century resulted in the conversion of conifer-dominated forests (redwood and Douglas fir) in the Santa Cruz Mountains to chaparral and oak-dominated woodlands. Periodic stand-replacing fire is required for the regeneration of knobcone pine woodland.

### Threats

Conifer-dominated land cover types have been heavily affected by timber harvesting, urban development, and agricultural conversion. When urban land is adjacent to or surrounds these natural communities, there is a significant reduction in habitat value. Noise, light, irrigation, and frequent disking for fire protection can substantially degrade habitat conditions and the chance of fire

increases. Habitat is also threatened by invasion of exotic plant species in the understory.

## Wetlands

Wetland habitat includes areas subject to seasonal or perennial flooding or ponding, or that possess saturated soil conditions and that support predominantly hydrophytic or “water-loving” herbaceous plant species. Because wetlands are periodically waterlogged, the plants growing in them must be able to tolerate low levels of soil oxygen associated with waterlogged or hydric soils. The presence of flood-tolerant species is often a good indication that a site is a wetland even if the ground appears to be dry for most of the year (Barbour et al. 1993; Santa Clara Valley Water District 2002a), or if hydrologic influences are less obvious.

Wetland habitat in the study area was classified into two land cover types.

- Coastal and valley freshwater marsh.
- Seasonal wetland.

In general, wetlands represent a sensitive biotic community due to their limited distribution and importance to special-status plant and wildlife species.

## Historical Extent and Composition

Wetland habitats, in particular seasonal wetlands, were almost certainly more abundant in the study area than they are today. Historically, vernal pools and other seasonal wetlands and ponds were likely scattered throughout the lowland portions of the study area and streams flowed unimpeded by the channels, water diversions, and barriers that are present today. At the time of the Portola expedition in 1769, large marshes, especially near the lower portions of Coyote Creek and the Guadalupe River, reportedly made overland travel by foot very difficult (Santa Clara Basin Watershed Management Initiative 2003).

Two large freshwater wetland areas, Laguna Socayre and Laguna Seca, were located within the Coyote Watershed prior to reclamation activities. These lagunas were a type of perennial emergent freshwater wetland that has groundwater at or near the surface through most, if not all of the year. Laguna Socayre, located east of downtown San José, above and below Capitol Expressway between Story and Tully Road, was a series of historic freshwater wetlands, which included a large freshwater marsh which partly overlaps with modern-day Lake Cunningham (Grossinger et al. 2006). It was created by an old levee of Coyote Creek and intercepted flood flows from the surrounding tributary creeks and may have received emergent groundwater as well. Laguna Seca in Coyote Valley, was an approximately 1,000-acre spring-fed perennial wetland complex formed as the Santa Teresa Hills forced groundwater to the surface. Drainage was blocked by the bedrock of the Santa Teresa Hills and the natural levees of Coyote Creek (Grossinger et al. 2006). In certain years



during the dry season, Laguna Seca would dry up completely. It was reclaimed from 1916–1917.

In the low-lying bottomlands, poorly drained basin areas between alluvial fans, flooded wet meadows or marshes sometimes were formed around smaller perennial freshwater marshes and lagunas. In addition, the heavy organic clay soils characteristic of the bottomland areas, often referred to as “black adobe” soils resulted in surface expression of groundwater in seasonally flooded wet meadows and perennial wetland complexes (Grossinger et al. 2006). In addition, bedrock hills prevented drainage of the lower Coyote Valley, which created vast wet meadows with perennial marshes and ponds. The natural levees of Coyote Creek and flat topography also prevented surface runoff and helped created these wet meadows. The dominant plant species in wet meadows or marshes were probably rhizomatous ryegrasses (*Elymus* spp.) (Grossinger et al. 2006). Large stands of saltgrass and alkali meadow were also extensive in the Coyote Watershed, particularly in the lowlands near lower Penitencia Creek and downgradient from Laguna Socayre (Grossinger et al. 2006). Remnant stands of alkali meadows are still present around the fringes of Lake Cunningham in San José. Historic patterns of wetlands in the Guadalupe Watershed are likely to be similar to those in the Coyote Creek Watershed. In the Uvas/Llagas/Pacheco/Pajaro watersheds seasonal or perennial wetlands were present near the mouths of Uvas and Llagas creeks, and the Soap Lake wetland complex of wetlands, vernal pools and alkali meadows was much more extensive than at present in the upper Pajaro River/lower Pacheco Creek area (San Francisco Estuary Institute 2008).

In a statewide study of vernal pools, CDFG identified large portions of Santa Clara County as potentially supporting vernal pools based on the presence of vernal pool species<sup>17</sup> (California Department of Fish and Game 1998). Vernal pools recognized in Santa Clara County are fault-zone sag-pond pools and serpentine vernal pools (California Department of Fish and Game 1998; Santa Clara Basin Watershed Management Initiative 2003). A vernal pool just north of the study area in southern Alviso is known to have existed prior to urban development in the area (Sally Casey pers. comm. 1998 in Santa Clara Basin Watershed Management Initiative 2003). Detailed investigations of historic records of wetlands and other land cover types in the Coyote Creek Watershed revealed no evidence of historic vernal pools (R. Grossinger pers. comm.). Vernal pools may have always been rare in the study area.

European settlement saw the introduction of nonnative aquatic species such as the bullfrog, into wetland habitats. Those areas whose hydrology has been altered by damming (e.g., stock ponds) or channelization have been particularly impacted.

<sup>17</sup> Vernal pools in most other regions were identified based on the unique signature on air photos of vernal pool landscapes and wetland complexes.

## Common Wildlife Associations

Wetland land cover types provide drinking water, as well as foraging, breeding, and resting habitat for many forms of fish and wildlife, including birds, amphibians, reptiles and mammals. Wetlands provide stopovers for many species of waterfowl and songbirds. Many wildlife species, particularly invertebrates, spend their entire lives in wetlands.

Perennial wetlands are important habitat for a wide variety of wildlife species. Representative waterbirds that forage and rest in permanent wetlands and associated open-water areas include great blue heron (*Ardea herodias*) and great egret (*Ardea alba*); as well as various ducks, including wood duck, green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*) and American coot (*Fulica americana*); killdeer (*Charadrius vociferus*); and greater yellowlegs (*Tringa melanoleuca*). Typical amphibians and reptiles in this cover type include red-legged frog, western pond turtle, and garter snakes. Many of the larger mammals, such as mule deer, may frequent permanent wetlands and use them as a source of drinking water.

Seasonal wetlands (i.e., wet meadows, seeps) are commonly used by a variety of wildlife during the wet season, including various amphibians such as Pacific chorus frog (*Pseudacris regilla*), western toad (*Bufo boreas*), and California tiger salamander; shorebirds such as killdeer, black-necked stilt (*Himantopus mexicanus*), and American avocet (*Recurvirostra americana*); and passerines such as Brewer's blackbird (*Euphagus cyanocephalus*), red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), and American pipit (*Anthus rubescens*). During the dry season, a variety of small mammals may use seasonal wetland areas as forage source, including deer mouse, California vole, and long-tailed weasel; however, wet meadows and seeps are generally too wet to provide suitable habitat for small mammals. Raptors such as white-tailed kites, northern harrier, and red-tailed hawk may forage in this land cover type.

Wetland-associated wildlife species covered under this Plan include bay checkerspot butterfly, California tiger salamander, California red-legged frog, western pond turtle, western burrowing owl, tricolored blackbird (*Agelaius tricolor*), and San Joaquin kit fox (**Table 3-5**).

## Wetland Land Cover Types

Within the study area, wetlands were identified and mapped on the basis of their aerial photograph signatures and landscape positions that would support wetland hydrology. In late season imagery, wetlands appear greener than surrounding annual grassland. The minimum mapping unit for all wetland land cover types was 0.25 acre, with the exception of serpentine seeps (see *Grasslands*), which had no minimum mapping unit. Wetland subtypes were distinguished based on the color and texture of the signature on air photos.

On early spring imagery, coastal and valley freshwater marsh appeared pale brown and rough in texture because the emergent plants (cattails and bulrushes) have died back and have not yet started to grow. In contrast, at this time of year, seasonal wetlands appeared dark green, but are difficult to distinguish from the surrounding annual grassland, which also appears dark green at this time of year. In early winter imagery, both types of wetlands appear dark green, the color of the seasonal wetlands contrasting with the adjacent annual grasslands, which at that time of year appeared brown.

The USFWS's National Wetlands Inventory (NWI) data layer was examined and compared with the aerial photographs to assist in the recognition of additional wetland areas, particularly seasonal wetlands with ambiguous signatures.

### **Coastal and Valley Freshwater Marsh**

*Coastal and valley freshwater marsh* is dominated by emergent herbaceous plants (reeds, sedges, grasses) with either intermittent flooded or perennially saturated soils. Freshwater marshes are found throughout the coastal drainages of California wherever water slows down and accumulates, even on a temporary or seasonal basis. A freshwater marsh usually features shallow water that is often clogged with dense masses of vegetation, resulting in deep peaty soils. Plant species common to coastal and valley freshwater marsh predominantly consist of cattails (*Typha* spp.), bulrushes (*Schoenoplectus* and *Bolboschoenus* spp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.). Dominant species in perennial freshwater wetland in the study area include rabbitsfoot grass (*Polypogon* sp.), nutsedge (*Cyperus eragrostis*), willow weed (*Persicaria lapathifolia* [*Polygonum lapathifolium*]), and water cress (*Rorippa* spp.). Broadleaf cattail (*Typha latifolia*) and water-primrose (*Ludwigia* spp.) are common associates (Jones & Stokes 2000). Dominant species in nontidal freshwater marsh are narrow-leaved cattail (*Typha angustifolia*), rice cutgrass (*Leersia oryzoides*), bur-reed (*Sparganium eurycarpum*), alkali bulrush (*Bolboschoenus* [*Scirpus*] *robustus*), and perennial peppergrass (*Lepidium latifolium*) (Jones & Stokes 2002).

Coastal and valley freshwater marsh occupy an estimated 381 acres (0.1%) of the study area (**Table 3-7** and **Figure 3-10**). This land cover type is generally found in lowland areas adjacent to diked tidal wetlands, along the margins of lakes and reservoirs, and along the lower reaches of the Guadalupe River and Coyote Creek, upstream of tidal influence (Santa Clara Basin Watershed Management Initiative 2003). Wetlands in the study area range in size from less than an acre to up to 42 acres. The largest wetland can be found along Coyote Creek north of Morgan Hill and just west of U.S. 101. Along the lower reaches of the Guadalupe River and Coyote Creek, freshwater wetlands transition downstream into wetlands influenced by brackish water with less cattail and other freshwater-adapted species to more salt-tolerant species such as California bulrush.

One of the largest freshwater wetlands in southern Santa Clara County is San Felipe Lake, immediately adjacent to the study area in San Benito County and adjacent to Highway 152. San Felipe Lake, sometimes referred to as Soap Lake, is a natural, seasonal lake, fed by Ortega Creek, Pacheco Creek, and Tequisquita Slough. The lake drains through Millers Canal in San Benito County, which in

turn feeds the Pajaro River. The lake is part of a large floodplain called Bolsa de San Felipe (RMC 2005).

Covered species that may be found breeding in the coastal and valley freshwater marsh land cover type (**Table 3-5**) include tricolored blackbird, California red-legged frog, California tiger salamander, and western pond turtle. In addition, Bay checkerspot butterfly may move through this land cover type.

### Seasonal Wetlands

*Seasonal wetlands* are freshwater wetlands that support ponded or saturated soil conditions during winter and spring and are dry through the summer and fall until the first substantial rainfall. The vegetation is composed of wetland generalists, such as hyssop loosestrife, cocklebur (*Xanthium* spp.), and Italian ryegrass that typically occur in frequently disturbed sites, such as along streams. Common species in seasonal wetlands within the study area include water cress, water speedwell (*Veronica anagallis-aquatica*), and smartweeds (*Persicaria* [*Polygonum*] spp.) (Jones & Stokes 2000). Other dominant species are California aster (*Symphyotrichum chilense* [*Aster chilensis*]), white sweet clover (*Melilotus albus*), and narrow-leaved cattail (Santa Clara Valley Water District 2002a).

Seasonal alkali wetlands historically occurred in two locations in the study area, around what is now Lake Cunningham in San José (San Francisco Estuary Institute 2006) and in the Soap Lake area near the Pajaro River (San Francisco Estuary Institute 2008). Small remnant stands of seasonal alkali wetlands may still persist in these areas but they were too small to be mapped in our regional mapping effort.

Vernal pools are seasonal wetlands that pond water on the surface for extended durations during winter and spring and dry completely during late spring and summer. They support a typical flora largely composed of native wetland plant species. Vernal pools in eastern Alameda and Contra Costa Counties occur in distinctive topography with low depressions mixed with hummocks or mounds.

Vernal swales and pools have been documented from one location in the study area, on private ranches north of Gilroy (WRA Environmental Consultants 2008). These swales and pools are dominated by meadowfoam (*Limnanthes* spp.), button celery (*Eryngium aristulatum* var. *hooveri*), and calicoflower (*Downingia* spp.).

“Vernal basins,” which are seasonal wetland habitats found in grassland swales, have been documented in Coyote Lake-Harvey Bear Ranch (Rana Creek Habitat Restoration 2004)<sup>18</sup>. These basins host a limited flora that includes species such as coyote thistle (*Eryngium vaseyi*), African pricklegass (*Crypsis vaginiflora*), and flowering quillwort (*Triglochin* [*Lilaea*] *scilloides*). Historically, there may have been more vernal pools and vernal basins in the study area.

<sup>18</sup> Features such as these vernal basins or swales may have been the source of the vernal pool records in California Department of Fish and Game (1998).

Seasonal wetlands were first mapped using only air photo interpretation. When only 25 acres were mapped using this method, we supplemented this approach with additional data (NWI data and large project mapping). As a result, 201 acres, (0.04%) of the study area, of seasonal wetlands were mapped in the study area **Table 3-7** and **Figure 3-10**. Seasonal wetlands are likely still underrepresented in the land cover map because of their typically small size, isolated locations, and difficulty in interpreting the photographic signature of individual features. Because the land cover mapping was conducted primarily using aerial photos taken in December (2003 and 2005), some seasonal wetlands may have been mapped as coastal and valley freshwater marsh.

Western burrowing owl, San Joaquin kit fox, and Bay checkerspot butterfly may use seasonal wetlands as movement habitat. Both California tiger salamander and California red-legged frog use this land cover type for breeding and foraging (**Table 3-5**). Western pond turtle uses this land cover type for foraging. Tricolored blackbirds are known to use seasonal wetlands for foraging and breeding habitat.

Fragrant fritillary may occur within seasonal wetland land cover, however, data is insufficient for the study area (**Table 3-6**). This species would be restricted to specific habitat elements and micro-site characteristics within this land cover.

## Ecosystem Functions

### Function and Integrity

Wetland functional values are provided through several physical and biological processes (National Research Council 2001). Perennial and seasonal wetlands function as essential habitat for amphibians that depend on aquatic environments for reproduction and juvenile development. These wetlands also provide high levels of insect production, which in turn creates a major food source for amphibians, birds, and other insectivorous species. The cyclical nature of inundation and drought in seasonal wetlands allows these systems to support a unique suite of highly adapted biota. Perennial wetlands are permanent water sources during the dry season in an otherwise arid landscape and thus function as essential habitat for a wide variety of water-dependant wildlife.

Wetlands also perform important functions with regard to physical processes. For example, wetlands play an important role in regulating biogeochemical cycles such as the nitrogen cycle. Wetlands also mediate flows in local streams and springs by providing temporary surface water storage and gradual recharge to local aquifers. On a small scale, wetlands in the study area also reduce erosion and sedimentation by reducing surface runoff.

Marshes recharge groundwater supplies and moderate streamflow by providing water to streams. This is an especially important function during periods of drought. The presence of marshes in a watershed helps to reduce damage caused by floods by slowing and storing floodwater. As water moves slowly through a marsh, sediment and other pollutants settle down to the bottom of the marsh. Marsh vegetation and microorganisms also use excess nutrients for growth that

can otherwise pollute surface water such as nitrogen and phosphorus from fertilizer.

### **Natural Disturbance**

Seasonal flooding is a key natural disturbance in seasonal wetlands. Marsh and other wetland plant species must tolerate flooding during the growing season and thus be able to tolerate anoxic conditions. Prolonged flooding can kill off wetland plants if the shoots have been destroyed by grazing or fire prior to the flood event (Keddy 2000). Dry periods can function as a disturbance as well. Sediment deposition is a key feature of wetland communities. Seedlings are sensitive to sediment burial, which can prevent or reduce germination (Keddy 2000). As a marsh ages, vegetation accumulates and may fill the pools of open water present which can eventually lead to meadow creation (Faber 1982).

### **Threats**

Threats to wetland land cover types include pollution, grazing, changes in hydrologic regime, conversion to other land uses such as agriculture or urban development, nonnative species invasion, and natural processes such as fire or flood. Fertilizer, pesticides, and untreated sewage contribute to pollution and result in a decrease in oxygen, which can kill vegetation within wetlands. Grazing disturbs the vegetation around marshes and can result in invasion of nonnative plant species into the marsh area (Holland and Keil 1995). The establishment and spread of invasive nonnative species can also result from urban ornamental landscape species (e.g., weeping willow [*Salix babylonica*], red sesbania [*Sesbania punicea*]) that are transported or reseed within drainages and watersheds, ultimately finding their way into downstream wetlands. Hydrologic regime changes can result from the construction of dams and weirs, extraction of groundwater and the creation of artificial drainages. Conversion of land to other uses can lead to the direct loss of wetland habitats as such lands are regraded and/or filled for such uses. In addition, increased stormwater runoff from impermeable surfaces can flow so rapidly into adjacent wetlands that it causes excessive scour and wetland habitat loss. Excessive sediment deposition following fire can virtually fill in wetlands, burying marsh vegetation.

## **Open Water**

*Open water land cover types* consist of open water or aquatic habitats such as lakes, reservoirs, water-treatment ponds, sloughs, and ponds (including percolation and stock ponds) that do not support emergent vegetation. Open water habitat in the study area is classified into two land cover types.

- Pond.
- Reservoir.

Natural lakes were originally included as a separate land cover type. However, no natural lakes were mapped in the study area and therefore are not discussed below.

## Historical Extent and Composition

Open water land cover types were historically less prevalent than they are currently. With only a few exceptions, lakes, reservoirs, and ponds did not exist in the Plan study area until they were built to support livestock and provide a water supply for the population of Santa Clara County.

Very few naturally occurring ponds existed historically in the study area. At least two large perennial freshwater ponds were located along the valley floor in the Coyote Watershed (Grossinger et al. 2006). Beginning in earnest in the mid-1800s with the advent of the gold rush, the population of the Santa Clara Valley grew rapidly. With this growth came ranchers who built hundreds of stock ponds in the study area to water grazing livestock, largely with technical and financial assistance from the U.S. Department of Agriculture (USDA) Soil Conservation Service. Stock ponds continue to dot the study area, including in now-protected open spaces.

Percolation ponds were also built throughout the study area to recharge the groundwater basin during wet and dry seasons. Currently, 71 percolation ponds are managed by SCVWD in the county for this purpose (Santa Clara Valley Water District 2002b). They are actively managed as “industrial water production facilities,” and most are in urbanized areas.

At least one seasonal lake, Laguna Seca, was located at the north end of the area now known as Coyote Valley at the base of the saddle between Tulare Hill and the Santa Theresa Hills (Grossinger et al. 2006). One or two perennial freshwater wetlands, which may have functioned more as a lake than a wetland during the wet season, also existed along the valley floor in the Coyote Creek watershed (Grossinger et al. 2006). These features were drained in 1919 to allow farming in the area.

Most lakes in the study area are man-made reservoirs that were built in the 1930s and 1950s, mostly for water supply purposes. SCVWD owns and operates seven dams and associated reservoirs (Almaden, Anderson, Calero, Coyote, Guadalupe, and Uvas, and Vasona) in the study area for water supply, and one reservoir, Chesbro Reservoir built in 1955, for flood protection and water supply purposes (Santa Clara Valley Water District 2005). Other reservoirs in the study area include the North Fork Pacheco Reservoir (built for agricultural water supply) and several small reservoirs located in unincorporated areas of the County along the western foothills of the Diablo Range.

## Common Wildlife Associations

Open water land cover types provide drinking water, as well as foraging, breeding, and resting habitat for a variety of terrestrial and aquatic wildlife, including birds, amphibians, reptiles, and large mammals. Reptiles such as western pond turtle and garter snakes use available water resources and the

vegetation surrounding open waters as habitat. Mammals use all types of open water resources for drinking and hunting.

All open water land cover types support a variety of ducks including mallard, green-winged teal, cinnamon teal (*Anas cyanoptera*), gadwall (*A. strepera*), American wigeon (*A. americana*), and American coot. Raccoons forage for adult and larval amphibians, fish, and crayfish.

Ponds attract many birds that are normally found in the adjacent grasslands; for example, California quail, mourning dove, and barn and cliff swallows (*Hirundo rustica* and *H. pyrrhonota*) all require daily water and are known to use ponds as water sources. The tricolored blackbird relies on vegetation associated with ponds (cattails and bulrush) for nesting. Many covered species, including California tiger salamander, California red-legged frog, and western pond turtle, use ponds as essential habitat; western pond turtle can be found inhabiting perennial ponds year-round and nesting in adjacent upland habitat during the nesting period. Ponds that contain either submerged or emergent vegetation are of particular importance to native amphibians as breeding habitat, although in ponds with little or no vegetation, California tiger salamander females may attach eggs to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). In perennial ponds, nonnative bass (*Micropterus* spp.) and bullfrog (*Rana catesbeiana*) are common and are often prevalent wildlife species. Bass and bullfrog are known to prey on special-status California red-legged frog and California tiger salamander and, as such, the presence of bullfrogs and bass limits the opportunity for success of these covered species.

Percolation ponds have minimal habitat values due to their location in urban areas. Percolation ponds require aggressive maintenance to maintain percolation capacity and preserve groundwater recharge for the water supply. Ponds with wetland fringe habitat (i.e., emergent vegetation) provide potential habitat for western pond turtle, California red-legged frog, and California tiger salamander. Most percolation ponds have only marginal habitat value for the covered species.

Reservoirs support several gull species as well as raptors that fish out of the lake and often nest in tall trees nearby. Shore and wading birds including killdeer, black-necked stilt, greater yellowlegs, and several gull species are found in and at the edges of reservoirs within the study area. Reservoirs provide habitat for some native fish such as hitch, Sacramento blackfish, California roach, and Sacramento sucker, but favor nonnative fish such as bluegills, sunfish, brown bullheads, carp, goldfish and largemouth bass. Reservoirs can also provide suitable rearing habitat for non-migratory rainbow trout if conditions are favorable. Reservoirs also promote the presence of nonnative fish in the watershed by providing suitable habitat. Nonnative fish often prey on native fish; for example, largemouth bass may prey on juvenile steelhead trout (Santa Clara Basin Watershed Management Initiative 2003).

Covered species found within the open water community include Bay checkerspot butterfly (for movement), California tiger salamander, California red-legged frog, western pond turtle, and tricolored blackbird.



## Open Water Land Cover Types

### Ponds

*Ponds* are small (less than 20 acres) perennial or seasonal water bodies with little or no vegetation. If vegetation is present, it is typically submerged or floating. Ponds may occur naturally or may be created or expanded for livestock use (stock ponds). All ponds discernible on aerial photographs were mapped.

Ponds were easily discernible on the basis of two distinctive aerial photograph signatures. One signature—smooth, uniform, and dark black—indicates deeper and less turbid ponds. The other signature—light gray-brown—generally indicates a shallower or more turbid pond. The latter signature was more difficult to discern on the aerial photographs and in some cases required field verification or corroboration with other wetland mapping (e.g., National Wetland Inventory). Where discernible, this land cover type was mapped to the high water line. Some wetland land cover types were likely included as ponds if vegetation was sparse or not visible on photos. The minimum mapping unit was 0.25 acre.

Off-stream groundwater recharge ponds, (commonly referred to as *percolation ponds*) are used in the study area in the following locations (Santa Clara Basin Watershed Management Initiative 2003):

- along Los Gatos Creek downstream of Lexington and Vasona Reservoirs;
- along Alamitos Creek, Guadalupe Creek, and the Guadalupe River downstream of Almaden, Calero, and Guadalupe Reservoirs;
- along Coyote Creek downstream of Anderson Reservoir; and
- along Llagas Creek downstream of Chesbro Reservoir.

Percolation ponds are located at sites where gravels and sands have been naturally deposited at or near ground level and where water can soak down most easily into the aquifer(s) (Santa Clara Valley Water District 1978 as cited in Santa Clara Basin Watershed Management Initiative 2003). These ponds are designed to allow infiltration of water at specified rates and must be cleaned out periodically when fine sediments build up, impeding percolation. These off-stream ponds are filled in the winter months with natural flow from rainwater. During the drier months, the SCVWD augments groundwater recharge in percolation ponds with imported water, including water from the Central Valley Project (Santa Clara Basin Watershed Management Initiative 2003).

Stock ponds are also used throughout the study area to provide water to grazing livestock. Lands historically used for grazing, but currently protected as open space, also contain old stock ponds that may be in disrepair. One example is in Henry W. Coe State Park where many stock ponds still exist (A. Palcovik pers. comm.). Many of these ponds currently support California red-legged frog or California tiger salamander. Park managers have reclaimed some ponds, returning them to a more natural state. Pond reclamation typically includes removal of the dam. The result is a shortened or eliminated hydroperiod of standing water, which may reduce the habitat value for covered species.

Pond vegetation is influenced by surrounding land use, livestock and wildlife activity, and site soil and hydrology. Plants often associated with ponds include floating plants such as duckweed (*Lemna* spp.) or rooted plants such as cattails, bulrushes, sedges, rushes, water cress, and water-primrose. Stock ponds are often surrounded by grazing land with grazing livestock. Immediately adjacent to the stock pond, soil may be exposed due to the continued presence of livestock or wildlife (e.g., feral pigs). As a result, many stock ponds are devoid of vegetation. Covered species, such as California tiger salamander may still use this habitat for breeding. Females may attach eggs to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). Stock ponds, removed from grazing pressures or excessive wildlife activity, may be surrounded by wetland vegetation including willows, cattails, reeds, bulrushes, sedges, and tules (*Schoenoplectus* [*Scirpus*] *californicus*) if the appropriate soil and hydrology is also present. Land uses surrounding percolation ponds may vary depending on the location of the pond. Percolation ponds are often found in more urbanized areas; therefore, the vegetated buffer may be narrower than it would be in a natural setting or managed for weed abatement.

Ponds are scattered throughout the study area, with the heaviest concentrations in the southeast corner of the study area, away from urbanized areas. **Figure 3-13** depicts the distribution of pond density in the study area. There are an estimated 716 ponds that occupy approximately 1,110 acres (0.2%) of the study area (**Table 3-7** and **Figure 3-10**).

Several species covered by this Plan can be found in or using ponds including California tiger salamander, California red-legged frog, western pond turtle, and tricolored blackbird. Bay checkerspot butterfly may pass over ponds on their way to habitat patches.

### Reservoirs

*Reservoirs* are large open water bodies, greater than 20 acres that are highly managed for water storage, water supply, flood protection, or recreational uses. These features were easily targeted on aerial photographs based on the smooth, uniform, dark signatures of open water. Where discernible, reservoirs were mapped to the high water line. The high water line was observed on the aerial photographs as either obvious rings of sparse vegetation or an open water signature.

Plants often associated with reservoirs include those plants common to deep water systems. Algae are the predominant plant life found in the open waters of reservoirs. Depending on reservoir temperature, water level, and other environmental conditions, algal blooms may occur, resulting in thick algal mats on the surface of the reservoir. If the reservoir edges are shallow, plant species similar to those found in ponds may be present. If the reservoir has steeper edges, water depth and fluctuations in reservoir height may prevent the establishment of vegetation. Upland and riparian trees that were not removed during the construction of the reservoir, or that were planted afterwards, may be present around the perimeter of the reservoir. Fluctuations in water levels may also affect the type of shoreline habitat that occurs around reservoirs (Santa Clara Basin Watershed Management Initiative 2003). The upstream end of several

reservoirs including Coyote Reservoir support large and important stands of riparian forest and woodland (these areas were mapped as riparian woodland).

Surrounding land uses at reservoirs vary depending on the location of the reservoir and the land cover type present in the area prior to reservoir development. Reservoirs are dispersed throughout the study area. Vasona, Guadalupe, and Almaden Reservoirs are located on the western border of the study area. Calero, Chesbro, and Uvas Reservoirs are located in the foothills of the Santa Cruz Mountains, west of Coyote Valley, Morgan Hill, and San Martin. Anderson and Coyote Reservoirs are located in the foothills of the Diablo Range, east of Morgan Hill and San Martin. Pacheco Reservoir is located in the southeast corner of the County, north of SR 152. Reservoirs occupy approximately 2,767 acres (0.6%) of the study area in 18 locations (**Table 3-7** and **Figure 3-10**).

Species covered by this Plan that may be found living in or using reservoirs are western pond turtle and tricolored blackbird.

## Ecosystem Functions

### Function and Integrity

Open water land cover types perform a variety of functions in both biological and physical terms. Biologically, water is the most critical component required to support the lifecycle of all aquatic and terrestrial species. Open water land cover types support the species at the lowest level of the food chain, algae. Aquatic invertebrates feed on algae and other plant debris in creeks, ponds, and reservoirs. In turn, these invertebrates become food for fish, birds, bats, and other insect-feeding species. The cycle continues, supporting species of the highest trophic levels including coyotes, mountain lions, and humans.

Ponds enhance all other habitats in terms of value for wildlife. Mammals, birds, reptiles, and amphibians from adjacent habitats are likely to use ponds en route to surrounding areas (Santa Clara Basin Watershed Management Initiative 2003). Many upland species rely on streams and ponds as water sources, especially during the dry summer months.

Percolation ponds, while often seasonally stable in water level, are highly manipulated and provide varying degrees of habitat value. While emergent vegetation frequently develops along the shoreline of percolation ponds, the buffer zone between these emergent wetlands and adjacent urban land uses, such as parks or housing, limit wildlife access and use of these ponds by mammals, amphibians, and reptiles. While birds maintain access to percolation ponds, human activity and domestic pets around the shoreline limit nesting by waterfowl and other birds (Santa Clara Basin Watershed Management Initiative 2003). Periodic maintenance of percolation ponds can interrupt aquatic system functions, resulting in the loss of those primary food chain constituents such as detritus, algae, and emergent vegetation.

Reservoirs are sediment sinks, obstructing the natural sediment transport of streams. Through natural processes, streams erode sediment from stream banks and move it down stream. In an unimpeded setting, sediment carried from the upper watershed is deposited along the length of the stream, thus creating an equilibrium of eroded and deposited sediment. When a dam is built across a stream, all but some of the finest sediment transported from the upper watershed drops out of suspension in the reservoir, where velocities are too low to maintain the sediment load. The resulting effect is that downstream reaches are sediment-starved, and no new sediment is available to replace eroded sediment downstream of the dam. This results in the stream downcutting and deepening and also results in a reduction in gravels downstream of reservoirs. In addition, large reservoirs fill with and store large amounts of turbid storm runoff. Settling of the finer clay and silt particles may take months, resulting in persistent releases of turbid water in winter and early spring. The slowly settling materials may also result in much higher turbidities near the bottom outlet valve than in the surface waters. While the natural streams upstream of reservoirs rapidly clear between storms, the streams downstream of reservoirs may be persistently turbid. In addition, the slowly released fine sediments may result in silty substrate below the reservoirs, reducing abundance of insects. During parts of the year, the reservoir conditions may produce bioturbidity from organic production in the water column. Turbidity can also be caused by bio-productivity in the water column, which may affect the efficiency of visual feeding organisms.

Reservoirs disrupt the natural flow cycle of streams. In addition, because the reservoirs are deep and store cool winter runoff, the water released out of the bottom of the reservoir can be much cooler than the surface water and also cooler than the stream upstream of the reservoir in late spring and summer.

### **Natural Disturbance**

The role of disturbance in open water land cover types focuses on the mixing of water from the surface to the bottom. Wind contributes heavily to mixing of water in ponds and lakes. Mixing brings oxygen to the bottom of ponds and lakes while releasing nutrients into the water column that will feed plants and invertebrates. Disturbances to standing water bodies often relate to *eutrophication*, the natural processes by which excessive nutrients are deposited into the water body, stimulating plant growth. This rapid plant growth, often referred to as an *algal bloom*, reduces dissolved oxygen in the water as anaerobic microbes break down dead plant material. Reduced levels of dissolved oxygen, as well as reduced penetration of sunlight into the water, often lead to the die-off of other aquatic organisms. Eutrophication eventually leads to the filling in of the water body. Both ponds and reservoirs are susceptible to rapid eutrophication. In urbanized areas, or in areas with septic tanks or grazing livestock, this process is enhanced by excess nutrient input. Oxygen-depleting algal blooms may lead to fish kills.

Reservoirs may also suffer from a lack of mixing surface waters with water at deeper depths. Mixing distributes oxygen to the reservoir floor, preventing anaerobic conditions that may reduce the dissolved oxygen in the reservoir. Maintaining appropriate levels of dissolved oxygen is important for aquatic life in the reservoir and downstream of the reservoir, as well as for drinking water

supplies. Dissolved oxygen levels are also affected by water temperature. Warmer water contains lower levels of dissolved oxygen.

### Threats

Open water land cover types are threatened by pollution; livestock disturbance, including trampling and excessive nutrient inputs leading to rapid eutrophication; high water flows which cause erosion; habitat destruction; and unnatural channel modification resulting from the need to contain flows. The manipulation of otherwise natural processes (flooding, natural stream meandering) changes the ecosystem function of aquatic communities and generally reduces overall biodiversity and native survivorship by eliminating a dynamic component of the ecosystem. The various open water land cover types have different primary threats, as described below.

Pond breaching, berm failure, livestock and wildlife impacts, including feral pigs, and inadequate management practices can increase soil erosion and result in increased sedimentation of the pond (Hamilton and Jepson 1940; Prunuske 1987). This reduces habitat quality for amphibian habitat. Alternatively, ponds with insufficient turbidity provide inadequate cover for California tiger salamander larvae (69 FR 47216). Heavy livestock and excessive wildlife use (e.g., feral pigs) use can degrade ponds quickly, leading to loss of emergent vegetation and eutrophication from increased nitrogen due to cattle urine. High flows cause erosion, unless fully cemented channels are in place. To control flooding, channels are modified in an unnatural way (i.e., placement of rip rap, lined with concrete) and results in a decrease of riparian vegetation and aquatic habitat for fish and other species. Some cities are working to address this issue. For example, the City of San José requires that riparian vegetation be avoided during construction activities, and if it cannot be avoided, mitigation is required. Mitigation requires replacement of riparian vegetation and/or compensation for any adverse affects to creeks (City of San José 2005). Additionally, pollution sources along the channels can degrade water quality within riverine systems.

## Irrigated Agriculture

Irrigated agriculture encompasses all areas where the native vegetation has been cleared for irrigated agricultural use. This natural community does not include rangeland, which is often characterized as an agricultural land use. The irrigated agriculture community is classified into four land cover types.

- Orchard.
- Vineyard.
- Agriculture developed.
- Grain, row-crop, hay and pasture, disked/short-term fallowed<sup>19</sup>.

In all of these cases, the land may have been irrigated in the past but show little or no sign of irrigation currently (e.g., fallow fields). In some instances these

<sup>19</sup> This land cover type may or may not be irrigated.

land cover types were indistinguishable on aerial photographs (e.g., newly planted orchards strongly resemble row crops). In such cases the area in question was mapped as grain, row-crop, hay and pasture, and disked/short-term fallowed.

## Historical Extent and Composition

Father Junípero Serra gave Santa Clara Valley its name when he consecrated the Mission Santa Clara de Asís in 1777 (National Park Service 2006). The establishment of the mission also heralded the beginning of large-scale agriculture in the Santa Clara Valley. Soon, the Guadalupe River dam (located near Mission Santa Clara) was constructed for irrigation of wheat, corn, bean, and other crops. Fruit trees and grapes were also cultivated. Settlers' accounts during 1850 describe the whole plain of Alameda County to San José as a vast unfenced field of grain (Santa Clara Basin Watershed Management Initiative 2003).

The Santa Clara Valley has experienced continued population growth since 1850. By 1866, artesian wells could no longer meet water demands. In 1870, Los Gatos Creek was diverted in order to meet the water demands for agriculture and a booming population (Santa Clara Basin Watershed Management Initiative 2003). Agricultural success in the Santa Clara Valley was supported by access to railroads that could take goods to port. Large aquifers were also discovered underlying the valley and were tapped by artesian wells. These two factors bolstered a rapid increase in agriculture in the region. The area produced carrots, almonds, tomatoes, prunes, apricots, plums, walnuts, cherries, and pears for the world market (National Park Service 2006). In 1870, seed farms became another dominant form of agriculture in the valley. Other agricultural commodities harvested from the Santa Clara Valley included lumber and grapes for wineries (National Park Service 2006).

By 1930, there were 120,000 acres of orchards in production (Santa Clara Basin Watershed Management Initiative 2003). The Santa Clara Valley remained largely rural and agricultural, supporting farms, orchards, wineries, and ranches until after World War II (National Park Service 2006). Due to an increased demand for urban services, there was a one-third reduction in the amount of cultivated lands between 1947 and 1961 (Santa Clara Basin Watershed Management Initiative 2003). Despite these changes, the South Valley in Santa Clara County continues to support rural homesteads and agriculture.

## Common Wildlife Associations

Some native wildlife, such as small mammals, certain raptors, and migratory waterfowl, utilize irrigated agriculture seasonally or year-round. Year-round activity tends to be concentrated along the margins of active farmland where vegetation is less disturbed or where trees and shrubs tend to occur (some are planted deliberately as windbreaks). Open fields that are irrigated for forage crops are also used by wildlife. Cultivated agriculture is bisected by streams,

ditches, and channels. Some amphibians and reptiles utilize these linear aquatic features and the adjacent upland habitat.

Orchard and vineyard fruits attract common wildlife species such as scrub-jay, European starling (*Sturnus vulgaris*), western tanager (*Piranga ludoviciana*), Brewer's blackbird, American crow, yellow-billed magpie (*Pica nuttalli*), raccoon, opossum, California vole, and coyote. Orchards and vineyards that are not plowed provide foraging, cover, and denning sites for native gray fox and nonnative red fox (*Vulpes vulpes*), burrowing owl, California ground squirrel, and various gophers, mice, and snakes (Santa Clara Basin Watershed Management Initiative 2003). Insects are important pollinators of blossoms to ensure fruit. Owls and other raptors such as white-tailed kite, red-shouldered hawk, red-tailed hawk, and burrowing owl feed on rodents and insects found in orchards and vineyards. Old buildings and barns may provide shelter for bats and owls (Santa Clara Basin Watershed Management Initiative 2003).

Data collected in Sonoma County indicate that vineyards generally support a far higher abundance of nonnative predators such as red fox and feral cats than do adjacent natural habitats (Hilty and Merenlender 2004). Other common wildlife species found in most vineyards include California ground squirrel, European starling, and Brewer's blackbird. As in other forms of agriculture, site-specific production methods are directly correlated with wildlife use. Some vineyard practices may encourage habitat use by birds of prey such as American kestrel and great horned owl (Locke 2002). Wildlife use of vineyards may be related to the timing and intensity of pesticide application with heavy pesticide use decreasing wildlife use and reproductive success.

Dryland crops are usually established on fertile soils that have historically supported a variety of wildlife (Mayer and Laudenslayer 1988). Although grain cropland cover supports reduced wildlife habitat richness and diversity for native species, it does support a greater variety of wildlife species than traditional irrigated agricultural land cover (e.g., vineyards and orchards). Short-grass habitat associated with dryland grain production is compatible with foraging by raptors such as western burrowing owl. During winter, this type of agricultural land also provides important foraging and roosting habitat for wintering waterfowl.

Pastures support a variety of wildlife, particularly ground-nesting birds such as western meadowlarks (*Sturnella neglecta*). Irrigated pasture, particularly alfalfa, can provide a variety of wildlife benefits due to its relatively high production of small rodents. Several birds that forage in open grasslands, such as white-tailed kites and great blue herons, may also use this land cover type.

## **Irrigated Agriculture Land Cover Types**

### **Orchard**

*Orchards* are those areas planted in fruit-bearing trees. Orchard was distinguished on the basis of its tree cover, canopy characteristics, and distinctive production rows. In Santa Clara County, orchards mostly include apricots,

cherries, prunes, and walnuts (County of Santa Clara, Department of Agriculture 2004).

Orchards comprise an estimated 2,697 acres (0.06%) of the study area (**Table 3-7** and **Figure 3-10**). Orchards are scattered in relatively small patches throughout the Santa Clara Valley floor from the southern point of San José south to the county line. The largest patch of orchard is found in Coyote Valley in the area designated as the Coyote Greenbelt. Small orchards are also present south of Highway 130 in the Diablo Range foothills.

Some covered species may be found in orchards. For example, where natural open spaces abut, some individuals of San Joaquin kit fox may forage in and disperse through orchards. Western burrowing owl may forage in and move through orchards. Tricolored blackbirds may move through and/ or forage in and over orchards. Bay checkerspot butterfly, California red-legged frog and California tiger salamander may migrate through orchards between areas of suitable habitat. Western pond turtle may nest along the open margins of orchards, particularly if situated adjacent to suitable aquatic habitat (**Table 3-5**).

### **Vineyard**

*Vineyard* was identified on the basis of its row production pattern and canopy characteristics. Vineyards appeared similar to orchards on the aerial photographs but were characterized by more closely spaced rows with a smaller, less dense vegetation canopy.

Vineyards occupy 1,393 acres (0.3%) of the study area (**Table 3-7** and **Figure 3-10**). Vineyards are mostly located in the southern portion of the county, in the foothills west of San Martin, along Uvas Creek and its tributary Little Arthur Creek, and along SR 152 east of Gilroy. Similar covered species are expected to be found in vineyards as in orchards, with the exception of burrowing owl (**Table 3-5**).

### **Agriculture Developed**

*Agriculture developed* was identified by the presence of large agricultural buildings such as greenhouses, shadehouses, nurseries, corrals, or dairies. These intensive uses were found within agricultural areas rather than urban settings. Air photo signatures were generally distinctive because of their large agricultural structures or high densities of livestock.

This land cover type occupies 1,935 acres (0.4%) of the study area in small patches scattered throughout the Santa Clara Valley from Coyote Valley to the county line (**Table 3-7** and **Figure 3-10**). Covered species that may be found in this land cover type include western burrowing owl (e.g., in some of the larger corrals that may be less intensively used), tricolored blackbird, and migrating Bay checkerspot butterfly and San Joaquin kit fox (**Table 3-5**).

### **Grain, Row-Crop, Hay and Pasture, Disked/Short-Term Fallowed**

Tilled land not appearing in the aerial photographs to support orchard or vineyard was mapped as grain, row-crop, hay and pasture, disked/short-term fallowed.

*Grain, row-crop, hay and pasture, disked/short-term fallowed* is the most



common of the agriculture land cover types in the low-lying areas of the study area, occupying 33,648 acres (7.3%) of the study area (**Table 3-7** and **Figure 3-10**). These lands are abundant throughout the Santa Clara Valley south of San José, and are most dense just north of the southern county border.

*Row-crops* are those areas tilled and cultivated for agricultural crops such as corn, lettuce, peppers, and pumpkins. *Fallow fields* include fields that were not in production at the time aerial photos and/or site visits were conducted, but may be utilized for grain, row-crops, and hay and pasture in subsequent years. This land cover type includes ruderal areas that had been left fallow for several growing seasons. Ruderal sites may be dominated by weeds such as black mustard or thistles.

*Hay and pasture* include both dryland settings and irrigated areas. The key difference between hay production and pasture is that crops are harvested on site and consumed off site, whereas pasture is consumed by livestock on site (hay is also cut, baled, and trucked off site). In addition to production for consumption, hay is also produced in Santa Clara Valley for grain. The pasture land cover type consists of fast-growing annual and perennial grasses mixed with irrigated forage crops in the legume family. Pastures typically function as onsite sources of forage for livestock. These areas are distinguished from other cultivated land types by the presence of livestock and livestock fencing (paddocks). Pastures tend to occur in lowland areas adjacent to cropland. Pasture was mapped on aerial photographs based on its location and smooth texture on the photographs, indicating land that is covered by vegetation and not currently tilled for cropland.

Common vegetation includes fast-growing forage grasses, such as wild oats and Italian ryegrass, as well as irrigated legumes such as alfalfa (*Medicago sativa*), sweet clover (*Melilotus* spp.), and true clover (*Trifolium* spp.). In some areas, nonnative weedy vegetation, such as thistles, mustards, and a variety of other weedy forbs, are also common.

Covered species expected to be found in this land cover type are tricolored blackbird, and western burrowing owl all of which forage in grain crops and pastures (**Table 3-5**). Tricolored blackbird and western burrowing owls may also breed in agricultural settings. San Joaquin kit fox may move through this land cover type if it occurs near suitable grassland areas. California tiger salamander, California red-legged frog, and western pond turtle move through croplands to reach suitable breeding and aestivation habitat. Bay checkerspot butterfly migrate through these habitats between patches of serpentine grassland.

## Ecosystem Functions

### Function and Integrity

This land cover type has relatively low value for native plants and wildlife in terms of habitat that supports full lifecycle needs. Nonetheless, agriculture does provide some benefit, although species composition depends heavily on the planting cycle. For example, cropland has a higher value for terrestrial mammals (e.g., black-tailed jackrabbit) and herbivorous birds (e.g., red-winged blackbird)

near harvest time, when the standing crop is mature and produces a quantity of food (e.g., fruit, seeds), than it does after the harvest when the cropland is fallow. Agricultural production methods can also have an impact on wildlife use. For example, production practices such as *clean farming*, where farm edges are maintained as vegetation-free areas, reduce cover and movement opportunities for wildlife; on the other hand, *wildlife friendly farming*, where native cover crops and hedge rows are used between crops and on farm edges, can increase opportunities for wildlife use in croplands.

In addition, agricultural lands often play a key role in providing connectivity between larger open space areas, especially in urbanizing areas such as the Santa Clara Valley. Maintaining connectivity between open space patches that provide habitat supports a diversified genetic pool due to the ability of populations to disperse and co-mingle. Agriculture also often is associated with streams, canals, and ditches used for irrigation that may support riparian vegetation, trees (planted as windbreaks), and shrubs. These areas may provide habitat to songbirds, raptors, amphibians and reptiles, as well as provide a movement corridor for other species.

### **Natural Disturbance**

Disturbances common to cropland, orchards, and vineyards relate to the standard operations of farming practices. Seasonal tilling, planting, and harvesting prevent the long-term establishment of plants or animal burrows on this land. Management practices also usually include the application of pesticides, discouraging the establishment of plants or presence of wildlife. Furthermore, offsite drift may harm wildlife or plants in adjacent open space areas.

### **Threats**

Orchards, vineyards, and row-crops are often found in areas of low to moderate topographical variation—areas such as valley floors or foothills. In these areas, the major threat to irrigated agriculture is land conversion to urban uses, often as residential housing.

## **Developed**

Developed land cover types were mapped and described for the study area in order to describe the extent and distribution of modified lands. Developed areas were classified into the land cover types listed below.

- Urban-suburban.
- Rural-residential.
- Barren.
- Landfill.
- Golf courses/urban parks.
- Ornamental woodland.

Developed land cover types were mapped on the basis of their distinct signatures on aerial photographs and are readily distinguishable from naturally occurring signatures in any terrain. The minimum mapping unit for all developed land cover types was 10 acres.

## Common Wildlife Associations

Developed, or urban, areas tend to support a low diversity of wildlife (Dickman 1987; Gilbert 1989). However, what species do exist in urban areas tend to be present at greater concentrations than is typical of other habitat types (Gilbert 1989). A limited number of mostly nonnative species such as dogs, cats, house mice, Norway brown rats, pigeons, European starlings, and opossums thrive in urbanized habitats in the study area (Santa Clara Basin Watershed Management Initiative 2003).

Several species are common to urban areas, including a variety of bird species that adapt well to urban landscapes. Typical bird species found in the urban landscape include the American robin (*Turdus migratorius*), mockingbird (*Mimus polyglottos*), American crow (*Corvus brachyrhynchos*), and European house sparrow (*Passer domesticus*). These species are typically generalized opportunistic foragers that are highly tolerant of human activity. Few special-status avian species occur in urban areas, however, there are some notable exceptions. As discussed below, western burrowing owl, covered in this Plan, may be found in ruderal or barren remnant patches in urban areas. Peregrine falcons (*Falco peregrinus*) are found even in downtown San José, where one pair nested in 2006. In 2006 a colony of approximately 200 red-winged blackbirds and tricolored blackbirds was documented during field work for this project using the southern fringe of a pond located adjacent to U.S. 101 in a vacant lot in Morgan Hill.

Some wildlife species are abundant in the ruderal areas of agricultural sites where there is no disturbance from tilling and pest control measures. This is especially true for burrowing mammals such as California ground squirrels. Western fence lizards and gopher snakes, which often use mammal burrows for cover, are also more common in these urban areas. Other common wildlife found in urban areas include rodents, grey squirrel, opossum, raccoon, and skunk. Other wildlife, once less common in urban areas but now on the rise across the country, include deer, coyote, and wild turkeys.

Ornamental woodlands, including eucalyptus stands, are occasionally planted as wood lots or shelter belts. The overall wildlife value of ornamental woodlands is highly variable and depends on the species planted. For example, eucalyptus trees provide night roosts, foraging perches, and nest sites for a few bird species, particularly raptors. Eucalyptus bark peels can create microhabitats for some small vertebrate species, such as alligator lizards and woodrats (Santa Clara Basin Watershed Management Initiative 2003).

## Developed Land Cover Types

*Developed areas* comprise all types of development for residential, commercial, industrial, transportation, landfill, landscaping, and recreational uses (e.g., sites with structures, paved surfaces, horticultural plantings, golf courses, and irrigated lawns). Developed sites were mapped on the basis of their distinct signatures on aerial photographs. Developed areas are often characterized by geometric or regular shapes, and are readily distinguished from naturally occurring signatures in any terrain. This category was separated into six land cover types: urban-suburban, rural residential, barren, landfill, golf courses/urban parks, and ornamental woodland.

### Urban-Suburban

The *urban-suburban* land cover comprises areas where the native vegetation has been cleared for residential, commercial, industrial, transportation, or recreational structures, and is defined as one or more structures per 2.5 acres. These include areas that have structures, paved and impermeable surfaces, horticultural plantings, and lawns smaller than 10 acres (irrigated lawns larger than 10 acres were mapped as urban parks). Many small, rural residential areas were observed in the inventory area. Such areas were mapped as urban if they exhibited at least 10 acres of buildings, turf, and pavement. Rural residential areas of less than 10 acres that were adjacent to or surrounded by agriculture and/or natural land cover types were mapped as the adjacent land cover type. Parcels of non-urban land cover types within the study area on which development projects were already approved were mapped as urban-suburban.

Vegetation found in the urban-suburban land cover type is usually in the form of landscaped residences, planted street trees (i.e., elm, ash, liquidambar, pine, palm), and parklands. Most of the vegetation is composed of nonnative or cultivated plant species. One invasive nonnative tree, the tree-of-heaven, has become established in yards and vacant lots in the City of San José area (Santa Clara Basin Watershed Management Initiative 2003).

The major urban-suburban area in the study area is San José, located in the northern portion of the Santa Clara Valley. Other urban-suburban areas include areas within Morgan Hill and Gilroy. Urban-suburban areas comprise 89,438 acres (19.4%) of the study area (**Table 3-7** and **Figure 3-10**).

It is unlikely that any covered species would be found in urban-suburban areas; however, Bay checkerspot butterfly may migrate across urban-suburban areas (i.e., parking lots) between patches of serpentine grassland. Still, this land cover type is largely characterized by impermeable surfaces and extreme hazards to wildlife that provide no habitat value.

### Rural Residential

The *rural residential* land cover type is similar to the urban-suburban type except that it is typically much less dense (defined as less than 1 structure per 2.5 acres) and usually contains extensive landscaping and/or irrigated lands (including small areas of pasture).

Rural residential areas are mainly located in the foothills along the eastern edge of San José, at the southern point of San José near Almaden Quicksilver County Park and Santa Teresa County Park, and south of Morgan Hill and north of Gilroy. Rural residential areas comprise 12,414 acres (2.7%) of the study area (**Table 3-7** and **Figure 3-10**).

Several covered species may be found in rural residential areas. Species such as California red-legged frog, western pond turtle, western burrowing owl, tricolored blackbird, or San Joaquin kit fox may move through rural residential land cover if it occurs adjacent to or near open space. Bay checkerspot butterfly will move through rural residential areas to disperse between patches of serpentine grassland. Rural residential areas that contain small patches of serpentine soils may be used by dispersing Bay checkerspot butterflies as temporary foraging sites.

### **Barren**

*Barren* land cover types are non-agricultural areas that have been historically and recently disturbed. Land uses in this type include aggregate facilities and mine tailings. Barren land use types are uncommon throughout the study area. Barren land use types comprise only 211 acres (0.05%) of the study area in 6 locations.

While barren landscapes do not provide high quality for most covered species, this land cover type is often suitable for foraging and breeding western burrowing owls (**Table 3-5**). San Joaquin kit fox and tricolored blackbird may move through and/or forage in barren areas. California tiger salamander, California red-legged frog and Bay checkerspot butterfly may migrate through barren areas between habitat patches.

### **Landfill**

*Landfills* are those areas where vegetation has been cleared and large amounts of soil have been moved for solid waste disposal. Typically, these areas are excavated pits into which refuse is placed and compacted. After a landfill is closed and capped, it may be returned to natural habitats through planting and management. Only active landfills were mapped in this category.

There are three landfills within the study area: San José's Guadalupe and Kirby Canyon landfills, and a landfill east of Gilroy. The Guadalupe landfill is located on the border of the study area; it has a 411-acre permitted facility boundary and a 115-acre permitted disposal area. Eighty-eight acres of this facility (21%) is inside the study area. The Kirby Canyon landfill has a 760-acre facility boundary and a 311-acre disposal area, all of which is in the study area. The Gilroy landfill is approximately 82 acres.

Landfills were mapped as occurring on 364 acres (0.02%) of the study area (**Table 3-7** and **Figure 3-10**). The difference in mapped acreage and locally-approved boundaries indicates that the landfills are expected to expand in the future.

Landfills are highly disturbed areas while in use. They often attract some wildlife such as gulls, crows, pigeons, and rats. The only covered species that

may be found in landfill areas is Bay checkerspot butterfly as it migrates between suitable habitat patches.

### **Golf Courses/Urban Parks**

Urban parks are located within cities in the study area and tend to be smaller in scale than a county or regional park. Many serve as neighborhood or community parks.

*Urban parks* and *golf courses* are located throughout the urbanized areas of the study area. Urban parks and golf courses comprise 8,673 acres (1.9%) of the study area (**Table 3-7** and **Figure 3-10**).

Golf courses and urban parks provide limited habitat for native wildlife. Urban parks are unlikely to support any covered species. Golf courses on the fringe of urban areas are known to support California tiger salamander, California red-legged frog, western pond turtle, western burrowing owl, San Joaquin kit fox or tricolored blackbird, particularly if ponds are present on or near the golf course (**Table 3-5**). Bay checkerspot butterfly may migrate through this land cover type between habitat patches.

### **Ornamental Woodland**

*Ornamental woodlands* are those areas where ornamental and other introduced species of trees, including Eucalyptus, have been planted or naturalized and dominate, forming an open to dense canopy.

Ornamental woodland was mapped primarily in areas surrounded by development, where the signatures on aerial photographs and locations did not meet the characteristics of oak or riparian woodlands. Ornamental woodland was included as a separate land cover type because some stands could provide suitable habitat for raptors. The ornamental woodlands land cover type comprises only 95 acres (0.02%) of the study area (**Table 3-7** and **Figure 3-10**).

While ornamental woodland land cover does not provide appropriate habitat for most covered species, this land cover type may support breeding raptors.

**Table 3-1.** Natural Community Classification and Land Cover Types

Natural Community	Land Cover Type	Sensitive Land Cover Type*
<b>Grassland</b>	California annual grassland	
	Non-serpentine native grassland (not mapped)	✓
	Serpentine bunchgrass grassland	✓
	Serpentine rock outcrop	✓
	Serpentine seep	✓
	Rock outcrop	
<b>Chaparral and Northern Coastal Scrub</b>	Northern mixed chaparral/chamise chaparral	
	Mixed serpentine chaparral	✓
	Northern coastal scrub/Diablan sage scrub	
	Coyote brush scrub	
<b>Oak Woodland</b>	Valley oak woodland	✓
	Mixed oak woodland and forest	
	Blue oak woodland	
	Coast live oak forest and woodland	
	Foothill pine—oak woodland	
	Mixed evergreen forest	
<b>Riparian Forest and Scrub</b>	Willow riparian forest and scrub	
	Central California sycamore alluvial woodland	✓
	Mixed riparian forest and woodland	
	Riverine (also called streams)	
<b>Conifer Woodland</b>	Redwood forest	
	Ponderosa pine woodland	
	Knobcone pine woodland	
<b>Wetland</b>	Coastal and valley freshwater marsh	✓
	Seasonal wetland	✓
<b>Open Water (Aquatic)</b>	Pond	
	Reservoir	
<b>Agriculture</b>	Orchard	
	Vineyard	
	Agriculture developed	
	Grain, row-crop, hay and pasture, disked/ short-term fallowed	
<b>Developed</b>	Urban-Suburban	
	Rural residential (<1 unit per 2.5 acres)	
	Golf courses / Urban parks	
	Landfill	
	Ornamental woodland	
	Barren	
* Equivalent to sensitive natural communities as defined by the California Department of Fish and Game (California Department of Fish and Game 2003a).		

**Table 3-2.** Crosswalk of Land Cover Classification to Other Classification Systems

Habitat Plan Land Cover Type	Manual of California Vegetation and CDFG Vegetation Code <sup>1</sup>	CWHR <sup>2</sup> Habitat Type	Coyote Ridge Vegetation Associations <sup>3</sup>	GAP Map—Santa Clara County	SFPUC Alameda Watershed HCP Land Cover Types <sup>4</sup>
<b>Grassland</b>					
California annual grassland	41.280.00	Annual grassland	<i>Aegilops triuncialis</i> alliance, <i>Lolium multiflorum-Hemizonia congesta</i> (mixed herb) association, <i>Avena</i> spp. alliance, <i>Bromus hordeaceus</i> alliance, <i>Plantago erecta</i> alliance	Annual grassland	Nonnative grassland
Non-serpentine native grassland (not mapped)	41.150.00	Annual grassland	<i>Leymus triticoides</i> alliance, <i>Melica torreyana</i> grassland alliance, <i>Elymus multisetus</i> alliance, <i>Vulpia microstachys</i> grassland alliance, Purple Needlegrass alliance	Annual grassland	Valley needlegrass grassland
Serpentine bunchgrass grassland	41.280.00	Annual grassland	<i>Plantago erecta</i> alliance, <i>Vulpia microstachys</i> alliance, <i>Melica torreyana</i> grassland alliance, <i>Nassella pulchra</i> alliance, <i>Elymus multisetus</i> alliance, <i>Lolium multiflorum-Nassella pulchra-Astragalus gambelianus-Lepidium nitidum</i> association, <i>Lolium multiflorum-Nassella pulchra-Calystegia collina</i> (mixed herb) association	Annual grassland	Serpentine bunchgrass grassland
Serpentine rock outcrop	None	None	Not mapped	Barren	not mapped
Serpentine seep	45.56x.00 (in part)	Fresh Emergent Wetland	<i>Cirsium fontinale</i> var. <i>campylon</i> alliance, <i>Juncus xiphioides</i> alliance	Not mapped	Freshwater seep
Rock outcrop	99.900.04/ 99.900.05	None	Not mapped	Barren	Rock outcrop



Table 3-2. Continued

Habitat Plan Land Cover Type	Manual of California Vegetation and CDFG Vegetation Code <sup>1</sup>	CWHR <sup>2</sup> Habitat Type	Coyote Ridge Vegetation Associations <sup>3</sup>	GAP Map—Santa Clara County	SFPUC Alameda Watershed HCP Land Cover Types <sup>4</sup>
<b>Chaparral and Coastal Scrub</b>					
Northern mixed chaparral/chamise chaparral	37.000.01 / 37.101.00	Mixed chaparral / chamise-redshank	<i>Prunus illicifolia</i> alliance, <i>Arctostaphylos glauca</i> alliance, <i>Cercocarpus betuloides</i> alliance, <i>Adenostoma fasciculatum</i> - <i>Arctostaphylos glauca</i> - <i>Mimulus aurantiacus</i>	Mixed chaparral/chamise-redshank chaparral	Not mapped
Mixed serpentine chaparral	37.000.06	Mixed chaparral	<i>Rhamnus tomentella</i> alliance, <i>Pinus sabiniana</i> / <i>Artemisia californica</i> - <i>Ceanothus ferrisiae</i> - <i>Heteromeles arbutifolia</i> , <i>Adenostoma fasciculatum</i> - <i>Heteromeles arbutifolia</i> / <i>Melica torreyana</i> , <i>Arctostaphylos glauca</i> mixed ( <i>Artemisia californica</i> - <i>Salvia mellifera</i> ), <i>Arctostaphylos glauca</i> / <i>Melica torreyana</i> , <i>Artemisia californica</i> - <i>Ceanothus ferrisiae</i> , <i>Quercus durata</i> alliance	Mixed chaparral	Serpentine foothill pine-chaparral woodland?
Northern coastal scrub/Diablan sage scrub	(32.000.00)	Coastal scrub	<i>Salvia mellifera</i> alliance, <i>Artemisia californica</i> / <i>Eschscholzia californica</i> -Grass, <i>Artemisia californica</i> - <i>Salvia mellifera</i>	Coastal scrub	Diablan sage scrub
Coyote brush scrub	32.060.00	Coastal scrub	<i>Baccharis pilularis</i> alliance	Coastal scrub	Not mapped
<b>Oak Woodland</b>					
Valley oak woodland	71.040.05	Valley oak woodland	Not mapped	Valley oak woodland	Valley oak woodland, oak savannah
Mixed oak woodland and forest	71.100.00	Coastal oak woodland	Not mapped	Coastal oak woodland	Mixed evergreen forest/oak woodland
Blue oak woodland	72.020.00	Blue oak woodland	Not mapped	Blue oak woodland	Blue oak woodland, oak savannah

Table 3-2. Continued

Habitat Plan Land Cover Type	Manual of California Vegetation and CDFG Vegetation Code <sup>1</sup>	CWHR <sup>2</sup> Habitat Type	Coyote Ridge Vegetation Associations <sup>3</sup>	GAP Map—Santa Clara County	SFPUC Alameda Watershed HCP Land Cover Types <sup>4</sup>
Coast live oak forest and woodland	71.060.00	Coastal oak woodland	<i>Quercus agrifolia</i> alliance	Valley-foothill riparian	Central coast live oak riparian forest, coast live oak riparian forest, mixed evergreen forest/oak woodland
Foothill pine-oak woodland	87.130.05	Blue oak-foothill pine	Not mapped	Blue oak—foothill pine	Not mapped
Mixed evergreen forest	81.100.00	Montane hardwood-conifer	Not mapped	Montane hardwood-conifer	Mixed evergreen forest/oak woodland
<b>Riparian Forest and Scrub</b>					
Willow riparian forest and scrub	61.200.00 & 63.902.00	Valley-foothill riparian	Not mapped	Valley-foothill riparian	Central coast arroyo willow forest
Central California sycamore alluvial woodland	61.311.00	Valley-foothill riparian	<i>Platanus racemosa</i> alliance	Valley-foothill riparian	Sycamore alluvial woodland
Riverine	none	Riverine	Not mapped	Not mapped	Streams
Mixed riparian forest and woodland	61.900.00	Valley-Foothill Riparian	Not mapped	Not mapped	Not mapped
<b>Conifer Woodland</b>					
Redwood forest	86.100.00	Redwood	Not mapped	Redwood	Not mapped
Ponderosa pine woodland	87.010.00	Ponderosa pine	Not mapped	Ponderosa pine	Not mapped
Knobcone pine woodland	87.100.00	Closed-cone pine-cypress	Not mapped	Knobcone pine	Not mapped
<b>Wetland</b>					
Coastal and valley freshwater marsh	52.100.01	Fresh emergent wetland	Not mapped	Not mapped	Freshwater marsh
Seasonal wetlands	44.000.00	Fresh emergent wetland	<i>Juncus xiphioides</i> alliance (seasonal wetlands), <i>Phalaris aquatica</i> alliance (seasonal wetlands)	Not mapped	Not mapped

Table 3-2. Continued

Habitat Plan Land Cover Type	Manual of California Vegetation and CDFG Vegetation Code <sup>1</sup>	CWHR <sup>2</sup> Habitat Type	Coyote Ridge Vegetation Associations <sup>3</sup>	GAP Map—Santa Clara County	SFPUC Alameda Watershed HCP Land Cover Types <sup>4</sup>
<b>Open Water</b>					
Pond (0.25-20 acres)	None	Lacustrine	Not mapped	Lacustrine	Pond or reservoir
Reservoir (defined by management)	None	Lacustrine	Not mapped	Lacustrine	Pond or reservoir
<b>Agricultural</b>					
Orchard	None	Orchard—vineyard	Not mapped	Orchard and vineyard	Cultivated agriculture
Vineyard	None	Orchard—vineyard	Not mapped	Orchard and vineyard	Cultivated agriculture
Grain, row-crop, hay and pasture, disked/short-term fallowed	None	Cropland	Not mapped	Cropland	Cultivated agriculture
Agriculture developed/Covered Ag	None	Urban	Not mapped	Urban	Not mapped
<b>Developed</b>					
Urban-Suburban	None	Urban	Not mapped	Urban	Developed
Rural—residential (<1 unit per 2.5 acres)	None	Urban	Not mapped	Residential	Developed
Golf courses / urban parks	None	Urban	Not mapped	Urban	Turf
Landfill	None	Urban	Not mapped	Other urban or built-upland	not mapped
Ornamental woodland	None	Eucalyptus, Urban	Not mapped	Groves	Developed
Barren	None	Urban	Not mapped	Barren	Developed

## Notes:

<sup>1</sup> Sawyer and Keeler Wolf 1995; California Department of Fish and Game 2003a.

<sup>2</sup> CWHR= California Wildlife Habitat Relationships (Mayer and Laudenslayer 1988, 1999).

<sup>3</sup> Evens and San 2004; plant species nomenclature follows that listed in Evens and San 2004.

<sup>4</sup> This habitat conservation plan (Jones & Stokes 2005) is adjacent to the Santa Clara Valley Habitat Plan study area.

**Table 3-3a. Counts of Polygons of Field-Checked Land Cover Types in Valley Floor<sup>a</sup>**

[illegible]

Table 3.3a. Continued

Mapped Land-Cover Type	Field-Verified Land Cover Type (Corrected)																											
	California Annual Grassland	Serpentine Bunchgrass Grassland	Serpentine Rock/Outcrop	Rock Outcrop	Mixed Serpentine Chaparral	Northern Coastal Scrub/ Diablan Sage Scrub	Coyote Brush Scrub	Valley Oak Woodland	Mixed Oak Woodland and Forest	Blue Oak Woodland	Coast Live Oak Forest and Woodland	Foothill Pine-Oak Woodland	Willow Riparian Forest and Scrub	Mixed Riparian Forest and Woodland	Coastal and Valley Freshwater Marsh	Pond	Reservoir	Orchard	Vineyard	Grain, Row-Crop, Hay, Fallowed	Agriculture Developed	Urban/ Suburban	Barren	Rural Residential	Golf Courses/ Urban Parks	Landfill	Ornamental Woodland	Grand Total
Coastal and Valley Freshwater Marsh															1													1
Pond																1												1
Reservoir																	3											3
Orchard																		27	1	1			1				1	31
Vineyard	2																		18	4	1						1	26
Grain, Row-Crop, Hay, Fallowed	11																		1	14			1				3	30
Agriculture Developed																					27	8					2	37
Urban/Suburban																						28	1					29
Rural Residential																					2	1	27					30
Golf Courses/Urban Parks	2																					1		18			8	29
Landfill																								1	3		1	5
Ornamental Woodland											1															8		9
Barren																						2		1	2		14	19
Grand Total	19	1	1	3	2	1	1	4	12	7	6	2	1	12	1	1	3	27	20	19	30	40	30	20	5	8	30	306

<sup>a</sup> Entries in shaded cells in the diagonal indicate a match between the mapped and field-verified land cover type (i.e., a correct identification of land-cover type). Entries outside of the diagonal indicate an incorrect assignment.

**Table 3-3b.** Amounts of Field-Checked Land Cover Types (Acres) in Valley Floor<sup>a</sup>

[illegible]

Table 3-3b. Continued

Mapped Land-Cover Type	Field-Verified Land Cover Type (Corrected)																			
	California Annual Grassland	Serpentine Bunchgrass Grassland	Serpentine Rock/Outcrop	Rock Outcrop	Mixed Serpentine Chaparral	Northern Coastal Scrub/Diablan Sage Scrub	Coyote Brush Scrub	Valley Oak Woodland	Mixed Oak Woodland and Forest	Blue Oak Woodland	Coast Live Oak Forest and Woodland	Foothill Pine - Oak Woodland	Willow Riparian Forest and Scrub	Mixed Riparian Forest and Woodland	Coastal and Valley Freshwater Marsh	Pond	Reservoir	Orchard	Vineyard	Grain, Row-Crop, Hay, Fallow
Ponderosa Pine Woodland										1										
Coastal and Valley Freshwater Marsh															1					
Pond																2				
Reservoir																	320			
Orchard																		724	19	19
Vineyard	29																		1,044	261
Grain, Row-Crop, Hay, Fallow	770																		50	1,524
Agriculture Developed																				625
Urban/Suburban																				95
Rural Residential (<1 unit per 2.5 acres)																				20,084
Golf Courses/Urban Parks	76																			16
Landfill																				10
Ornamental Woodland																				11
Barren																				370
Grand Total	949	28	1	2	41	35	20	84	930	306	331	184	18	123	1	2	320	724	1,113	1,803
																				639
																				20,241
																				1,273
																				461
																				286
																				86
																				1,257
																				318
																				546
																				31,258

<sup>a</sup> Entries in shaded cells in the diagonal indicate a match between the mapped and field-verified land cover type (i.e., a correct identification of land cover type). Entries outside of the diagonal indicate an incorrect assignment.

**Table 3-4.** Uncertainties in Land Cover Mapping, by Land Cover Type

Land Cover Type	Comment	General Mapping Confidence <sup>1</sup>
<b>Grassland</b>		
California annual grassland	Almost always has a distinct signature, may be difficult to distinguish from some seasonal wetlands.	High
Serpentine bunchgrass grassland	As for California annual grassland. Uncertainty lies with available serpentine soils and geology mapping, from which this land cover was derived (see text).	High
Serpentine rock outcrop	Likely under-mapped because outcrops are generally small and below the minimum mapping unit of 0.25 acres; outcrops below a chaparral or woodland canopy would be missed.	Low
Serpentine seep	Could be difficult to distinguish if seep is seasonal (i.e., not perennial) and therefore would appear similar to surrounding grasslands on December aerial photograph.	Moderate
Rock outcrop	As for serpentine rock outcrop.	Low
<b>Chaparral and Northern Coastal Scrub</b>		
Northern mixed chaparral /chamise chaparral	Generally quite distinct; the main issue in mapping was the distinction with adjacent mixed oak or foothill pine-oak;- there was often a gradation rather than a distinct difference in signatures among these land cover types. This occurred mainly in the northeast and east portions of the study area where chaparral on south-facing slopes graded into mixed-oak woodland in drainages and on north-facing slopes with intermediate areas of taller chaparral and lower-stature oak. At times it was difficult to judge the height of vegetation on slopes from the photos.	High
Mixed serpentine chaparral	Clear signature, mapped where serpentine soils/rocks intersected with chaparral signature.	High
Northern coastal scrub/Diablan sage scrub	Northern coastal scrub dominated by California sagebrush had a distinctive pale green signature, but coastal scrub dominated by black sage appeared dark green and was similar in hue to chamise and to some of the components of mixed chaparral.	High
Coyote brush scrub	Dark green signature was similar to chamise and black sage; landscape position aided in distinguishing this uncommon type in the plan area.	Moderate
<b>Oak Woodland</b>		
Valley oak woodland	Main issue in mapping was distinguishing valley oak woodland from blue oak woodland. Valley oak trees typically appeared large-crowned, well-spaced, grayish (leafless) on the March 2003 photo, and were located on either broad ridge tops and shoulders or broad valley bottoms. Blue oak trees typically appeared smaller-crowned, closer-spaced, were beginning to leaf out in the March photos (earlier than valley oak), and were located on steeper, south, southwest, or southeast-facing slopes. Trees that appear intermediate in any of those characters were more difficult to classify, so large well-spaced blue oaks, denser stands of small-crowned valley oak, and blue oaks on valley bottoms were more likely to be mis-classified.	Moderate
Mixed oak woodland and forest	This type was characterized by a mix of deciduous and evergreen oaks; the two could be distinguished on the December 2003 or 2005 photographs when the deciduous trees were leafless; on the March 2003 photo, when the deciduous trees were in leaf, Mixed oak appeared similar to Coast live oak woodland. Because this type generally graded into the adjacent types with no clear distinction, the main issue was deciding where to separate the different types. Topography was helpful.	Moderate



Land Cover Type	Comment	General Mapping Confidence <sup>1</sup>
Blue oak woodland	See comments under Valley oak woodland. Blue oak woodland is much more abundant than Valley oak woodland, so errors in attributes would have greater effects on the Valley oak woodland land cover type than blue oak woodland.	High
Coast live oak forest and woodland	See comments under Mixed oak woodland and forest	Moderate
Foothill pine—oak woodland	The signature of foothill pine was usually distinctive. As discussed above, this type could grade into chaparral. December photos were taken at a time of day with pronounced shadows, which made isolated trees such as foothill pine easy to identify.	High
Mixed evergreen forest	Difficult to distinguish from Coast live oak woodland as both types are closed-canopy woodlands with similar dark green signatures. Geographic location was helpful – mixed evergreen occurred on the west side of the valley, while coast live oak woodland occurred throughout the plan area. Topography was somewhat useful – although both types occurred on north-facing slopes, Mixed evergreen was often in mid-slope positions while Coast live oak tended to be on the lower slopes.	Moderate
<b>Riparian Forest and Scrub</b>		
Willow riparian forest and scrub	Distinguished from Mixed riparian woodland by generally smaller stature trees and by the bright yellow appearance of small willows that retained their leaves into December; generally dominated by willow and lacking other species, such as bay and coast live oak, that would appear green in December photo, and alder, cottonwood, and valley oak, that would appear leafless in December. This type graded into Mixed riparian woodland, however, without a distinct boundary	Moderate-High
Central California sycamore alluvial woodland	Mature stands of sycamore had a distinctive signature in the December aerial, with the well-spaced large pale grayish crowns surrounded by a ‘halo’ of golden-yellow fallen leaves. Main difficulty in mapping was with large well-spaced cottonwood trees, which could appear similar to large sycamores, although the canopy was generally smaller. Land cover mapping for the HCP/NCCP was compared to field-based mapping conducted by CDFG (Keeler-Wolf et al. 1997) and found to be generally consistent (see text for more discussion).	Moderate-High
Mixed riparian forest and woodland	See comments under Willow riparian forest and scrub	Moderate-High
Riverine	Not mapped; using linear data sets provided by SCVWD.	N/A
<b>Conifer Woodland</b>		
Redwood forest	Mature redwood canopies were readily distinguishable; main confusion would be with Douglas-fir, which fieldwork revealed to be relatively uncommon (no large stands were observed); areas with regenerating redwoods could be confused with mixed evergreen forest.	Moderate-High
Ponderosa pine woodland	Very clear signature and restricted geographic distribution in the plan area made this a distinct type: ponderosa pine occurs on just 3 ridges with widely scattered tall trees casting distinctive long shadows on the surrounding grassland. However, small stands of ponderosa pine also occurred in some of the valley below the ridges, where they could be difficult to distinguish from the surrounding evergreen oak crowns.	High
Knobcone pine woodland	Restricted geographic and topographic distribution in the Plan but lacking a distinctive signature, mostly identified on the basis of geographic and topographic location (ridgetops in the extreme west of the plan area).	High

Land Cover Type	Comment	General Mapping Confidence <sup>1</sup>
<b>Wetland</b>		
Coastal and valley freshwater marsh	Generally had a distinct signature. Some freshwater marshes may have been below the minimum mapping unit of 0.25 acres. Photos from three seasons (winter 2003 and 2005, spring 2003) ensured that conditions were favorable to perennial marsh on one or more air photos.	Moderate
Seasonal wetlands	Color differences in seasonal wetlands were difficult to distinguish from a variety of surrounding land cover types, and resulted in a very small acreage of this land cover in the first draft of the maps. Many seasonal wetlands may occur at a scale below the minimum mapping unit of 0.25 acres. Subsequent mapping of seasonal wetlands using additional data sources (e.g., Coyote Valley Specific Plan and National Wetland Inventory data) have resolved some of the mapping uncertainties.	Low (Moderate <sup>2</sup> )
<b>Open Water (Aquatic)</b>		
Pond	Distinctive; main issue was visibility because of heavy shadows on the December photo when ponds were full.	High
Reservoir	Large, highly distinctive.	High
<b>Irrigated Agriculture</b>		
Orchard	Distinctive regular pattern of tree crowns; recently planted orchards could be confused with disked or fallow fields if the small trees were too small to be visible.	High <sup>3</sup>
Vineyard	Generally distinctive because of the narrow rows; recently planted vineyards could be confused with disked or fallow fields because the small vines were too small to be visible	High <sup>3</sup>
Agriculture developed	Distinctive	High <sup>3</sup>
Grain, row-crop, hay and pasture, disked/short-term fallowed	Distinctive; the main issue was more associated with the definition rather than recognition and was related to the separation of annual grassland and short-term fallow	High <sup>3</sup>
<b>Developed</b>		
Urban-Suburban	Distinctive	High <sup>3</sup>
Rural residential (<1 unit per 2.5 acres)	Distinctive	High <sup>3</sup>
Golf courses/Urban parks	Distinctive	High <sup>3</sup>
Landfill	Distinctive	High <sup>3</sup>
Ornamental woodland	Generally distinctive based on location and patterning of the tree crowns; many stands below minimum mapping unit of 10 acres but this is generally not important for the covered species.	Moderate <sup>3</sup>
Barren	Distinctive	High <sup>3</sup>
Notes:		
<sup>1</sup> Qualitative confidence in mapping in terms of accuracy of polygon boundaries, polygon attributes, and the extent of the land cover type in the study area (i.e., over- or under-mapped).		
<sup>2</sup> With supplemental mapping using additional data sets (see text under <i>Seasonal Wetlands</i> ).		
<sup>3</sup> See text and Tables 3-3a and 3-3b for quantitative error checking of agricultural and urban land-cover types. Quantitative error checking of natural land-cover types was not feasible.		

**Table 3-5. Covered Wildlife Species and Their Associated Land Cover Types**

Natural Community	Land Cover Type	Covered Species								
		Invertebrate	Amphibians				Birds			Mammals
		Bay checkerspot butterfly <i>Euphydryas editha bayensis</i>	California tiger salamander <i>Ambystoma californiense</i>	California red-legged frog <i>Rana draytoni</i>	Foothill yellow-legged frog <i>Rana boylei</i>	Western pond turtle <i>Clemmys marmorata</i>	Western burrowing owl <i>Athene cunicularia hypugea</i>	Least Bell's vireo <i>Vireo bellii pusillus</i>	Tricolored blackbird <i>Agelaius tricolor</i>	San Joaquin kit fox <i>Vulpes macrotis mutica</i>
Grasslands										
	California annual grassland	M	U,M	U,M		M	F,B		Y	M,F
	Non-serpentine native grassland (not mapped)	M	U,M	U,M		M	F,B		Y	M,F
	Serpentine bunchgrass grassland	Y	U,M	U,M		M	F		Y	M,F
	Serpentine rock outcrop/Barren	M	M	M						M,F
	Serpentine seep	M	U,M	M		M				M,F
	Rock outcrop	M								M,F
Chaparral and Coastal Scrub										
	Northern mixed chaparral/ chamise chaparral		U,M	M		M				
	Mixed serpentine chaparral	M	U,M	M		M				
	Northern coastal scrub/ Diablan sage scrub	M	U,M	M		M				
	Coyote brush scrub	M	U,M	M		M				
Oak Woodland										
	Valley oak woodland	M	U,M	M		M	F,M		Y	M,F
	Mixed oak woodland and forest		U,M	M		M				M
	Blue oak woodland	M	U,M	M		M				M
	Coast live oak forest and woodland	M	U,M	M		M				M
	Foothill pine—oak woodland		U,M	M		M				
	Mixed evergreen forest					M				
Riparian Forest and Scrub										
	Willow riparian forests and scrub	M	M	Y	M,F	Y		F, B	B	M
	Central California sycamore alluvial woodland		M	Y	M,F	Y		F, B	Y	M
	Mixed riparian forest and woodland	M	M	Y	M,F	Y		F,B	Y	M
Conifer Woodland										
	Redwood forest			M	M,F	Y				
	Ponderosa pine woodland		M	M		M				
	Knobcone pine woodland			M		M				

Key: U = Upland habitat; B = Breeding habitat; F = Foraging habitat; M = Movement habitat; Y = Year-round habitat (includes breeding)

Table 3-5. Continued

Natural Community	Land Cover Type	Covered Species								
		Invertebrate	Amphibians				Birds			Mammals
		Bay checkerspot butterfly <i>Euphydryas editha bayensis</i>	California tiger salamander <i>Ambystoma californiense</i>	California red-legged frog <i>Rana draytoni</i>	Foothill yellow-legged frog <i>Rana boylei</i>	Western pond turtle <i>Clemmys marmorata</i>	Western burrowing owl <i>Athene cunicularia hypugea</i>	Least Bell's vireo <i>Vireo bellii pusillus</i>	Tricolored blackbird <i>Agelaius tricolor</i>	San Joaquin kit fox <i>Vulpes macrotis mutica</i>
Wetland										
	Coastal and valley freshwater marsh	M	B,F	Y		Y			F,B	
	Seasonal wetland	M	B,F	B,F		F	M		F,B	M
Open Water										
	Pond	M	B,F	Y		Y			F,B	
	Reservoir					Y			F,B	
	Riverine	M	B,F, M	Y	Y	Y				
Agricultural										
	Orchard	M	M	M			F, M		F	M,F
	Vineyard	M	M	M					F	M
	Grain, row-crop, hay and pasture, disked/short-term fallowed	M	M	M		M	F,B, M		F,B	M,F
	Agriculture developed	M					F,M		F	M
Developed										
	Urban-suburban	M								
	Rural-residential	M		M		M	F, B		F	M
	Golf courses / urban parks	M	M	M		M	F, B		F	M
	Landfill	M								
	Barren	M	M	M		M	F, B		F	M,F

Key: U = Upland habitat; B = Breeding habitat; F = Foraging habitat; M = Movement habitat; Y = Year-round habitat (includes breeding)

**Table 3-6.** Covered Plant Species and Land Cover Types

Natural Community	Land Cover Type	Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	Coyote ceanothus <i>Ceanothus ferrisiae</i>	Mount Hamilton thistle <i>Cirsium fontinale</i> var. <i>campylon</i>	Santa Clara Valley dudleya <i>Dudleya abramsii</i> ssp. <i>setchellii</i>	Fragrant fritillary <i>Fritillaria liliacea</i>	Loma Prieta hoita <i>Hoita strobilina</i>	Smooth lessingia <i>Lessingia micradenia</i> var. <i>glabrata</i>	Metcalf Canyon jewelflower <i>Streptanthus albidus</i> ssp. <i>albidus</i>	Most beautiful jewelflower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>
<b>Grasslands</b>										
	California annual grassland					S				
	Non-serpentine native grassland (not mapped)									
	Serpentine bunchgrass grassland	P	P	P <sup>1</sup>	P	P		P	P	P
	Serpentine rock outcrop/Barren	P			P			P	P	P
	Serpentine seep			P						
	Rock outcrop									S
<b>Chaparral and Coastal Scrub</b>										
	Northern mixed chaparral/ chamise chaparral						S			
	Mixed serpentine chaparral		P				S			P
	Northern coastal scrub/ Diablan sage scrub					S				S
	Coyote brush scrub									
<b>Oak Woodland</b>										
	Valley oak woodland				P <sup>2</sup>	S				
	Mixed oak woodland and forest				P <sup>2</sup>	S	P			
	Blue oak woodland					S				
	Coast live oak forest and woodland				P <sup>2</sup>	S	P			
	Foothill pine—oak woodland					S				
	Mixed evergreen forest					S				

Key: P = Primary habitat (most likely to occur); S = Secondary habitat (unlikely but possible to occur); ? = may occur but data from study area is lacking.

Table 3-6. Continued

Natural Community	Land Cover Type	Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	Coyote ceanothus <i>Ceanothus ferrisiae</i>	Mount Hamilton thistle <i>Cirsium fontinale</i> var. <i>campylon</i>	Santa Clara Valley dudleya <i>Dudleya abramsii</i> ssp. <i>setchellii</i>	Fragrant fritillary <i>Fritillaria liliacea</i>	Loma Prieta hoita <i>Hoita strobilina</i>	Smooth lessingia <i>Lessingia micradenia</i> var. <i>glabrata</i>	Metcalf Canyon jewelflower <i>Streptanthus albidus</i> ssp. <i>albidus</i>	Most beautiful jewelflower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>
<b>Riparian Forest and Scrub</b>										
	Willow riparian forests and scrub									
	Central California sycamore alluvial woodland									
	Mixed riparian forest and woodland									
<b>Conifer Woodland</b>										
	Redwood forest					?				
	Ponderosa pine woodland									
	Knobcone pine woodland					?				
<b>Wetland</b>										
	Coastal and valley freshwater marsh									
	Seasonal wetland					?				
<b>Open Water</b>										
	Pond									
	Reservoir									
	Riverine									
<b>Agricultural</b>										
	Orchard									
	Vineyard									
	Grain, row-crop, hay and pasture, disked/ short-term fallowed									
	Agriculture developed									

Key: P = Primary habitat (most likely to occur); S = Secondary habitat (unlikely but possible to occur); ? = may occur but data from study area is lacking.

Table 3-6. Continued

Natural Community	Land Cover Type	Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	Coyote ceanothus <i>Ceanothus ferrisiae</i>	Mount Hamilton thistle <i>Cirsium fontinale</i> var. <i>campylon</i>	Santa Clara Valley dudleya <i>Dudleya abramsii</i> ssp. <i>setchellii</i>	Fragrant fritillary <i>Fritillaria liliacea</i>	Loma Prieta hoita <i>Hoita strobilina</i>	Smooth lessingia <i>Lessingia micradenia</i> var. <i>glabrata</i>	Metcalf Canyon jewelflower <i>Streptanthus albidus</i> ssp. <i>albidus</i>	Most beautiful jewelflower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>
<b>Developed</b>										
	Urban-suburban									
	Rural-residential									
	Golf courses / urban parks									
	Landfill									
	Barren									

Key: P = Primary habitat (most likely to occur); S = Secondary habitat (unlikely but possible to occur); ? = may occur but data from study area is lacking.

**Table 3-7.** Land Cover Types and their Extent in the Study Area

Vegetation Type	# of Polygons	Acres	Percent of Study Area
<b>Grasslands</b>			
California annual grassland	937	81,795	18
Non-serpentine native grassland (not mapped)	N/A	N/A	N/A
Serpentine bunchgrass grassland	329	10,308	2.2
Serpentine rock outcrop	136	260	0.05
Serpentine seep	40	34	0.01
Rock outcrop	80	87	0.02
<b>Chaparral and Coastal Scrub</b>			
Northern mixed chaparral / chamise chaparral	400	23,763	5.2
Mixed serpentine chaparral	181	3,712	0.8
Northern coastal scrub / Diablan sage scrub	486	10,306	2.2
Coyote brush scrub	12	180	0.04
<b>Oak Woodland</b>			
Valley oak woodland	393	12,895	2.8
Mixed oak woodland and forest	609	84,488	18.4
Coast live oak woodland and forest	376	31,652	6.9
Blue oak woodland	296	11,160	2.4
Foothill pine - oak woodland	190	10,960	2.4
Mixed evergreen forest	58	5,775	1.3
<b>Riparian Forest and Scrub</b>			
Willow riparian forest, woodland and scrub	293	2,544	0.6
Central California sycamore alluvial woodland	14	373	0.1
Mixed riparian woodland and forest	356	3,766	0.8
Riverine (streams, in miles; see text for data source)	N/A	2,392	N/A
<b>Conifer Woodland</b>			
Redwood forest	23	9,693	2.1
Ponderosa pine woodland	10	419	0.1
Knobcone pine woodland	11	711	0.1
<b>Wetland</b>			
Coastal and valley freshwater marsh	79	381	0.1
Seasonal wetland	135	201	0.04
<b>Open Water (Aquatic)<sup>1</sup></b>			
Pond	689	1,1105	0.2
Reservoir	16	2,767	0.6
<b>Agricultural</b>			
Orchard	96	2,697	0.6
Vineyard	34	1,393	0.3
Agriculture developed / covered agriculture	1047	1,935	0.4
Grain, row-crop, hay and pasture, disked/short-term fallowed	328	33,648	7.3



**Table 3-7. Continued**

Vegetation Type	# of Polygons	Acres	Percent of Study Area
<b>Developed</b>			
Urban-suburban	183	89,438	19.4
Rural – residential	362	12,414	2.7
Barren	6	211	0.05
Landfill	4	364	0.02
Golf courses / urban parks	293	8,673	1.9
Ornamental woodland	9	95	0.02
<b>Total</b>	<b>7,571</b>	<b>460,205</b>	<b>100.0</b>

<sup>1</sup> The number of polygons identified for each open water land cover is equal to the total number of open water bodies (e.g., 689 polygons for the pond land cover indicates there are 689 mapped ponds in the study area).

**Table 3-8.** Native Fish and Amphibian Species in Relation to Fish Communities in Santa Clara County Streams

Species	Fish Community						
	Cold Trout	Cold Steelhead	Warm Potential Trout/ Steelhead	Warm Native	Mixed Salmon	Mixed Native and Introduced	Fish Scarce
Resident trout	X						
Steelhead trout		X	(x)				X (migration)
Chinook salmon		(x)	(x)		X		(x) (migration)
Riffle sculpin	X	X					
Sucker	(x)	X	X	X	X	X	
Lamprey	(x)	X	X	(x)	X	(x)	X (migration)
Roach	(x)	X	X	X	X		
Pikeminnow		(x)	X	X			
Prickly sculpin			X	X	X		
Hitch			(x)	X	X		
Blackfish						X	
Tule perch						(x)	
Nonnatives Common					X	X	
California red-legged frog	X	X	(x)	(x)			
Foothill yellow-legged frog	X	(x)		X			
Western toad				X	(x)	(x)	(x)

Notes:

X = habitats commonly or reliably occupied.

(x) = habitats occupied intermittently or at low densities.

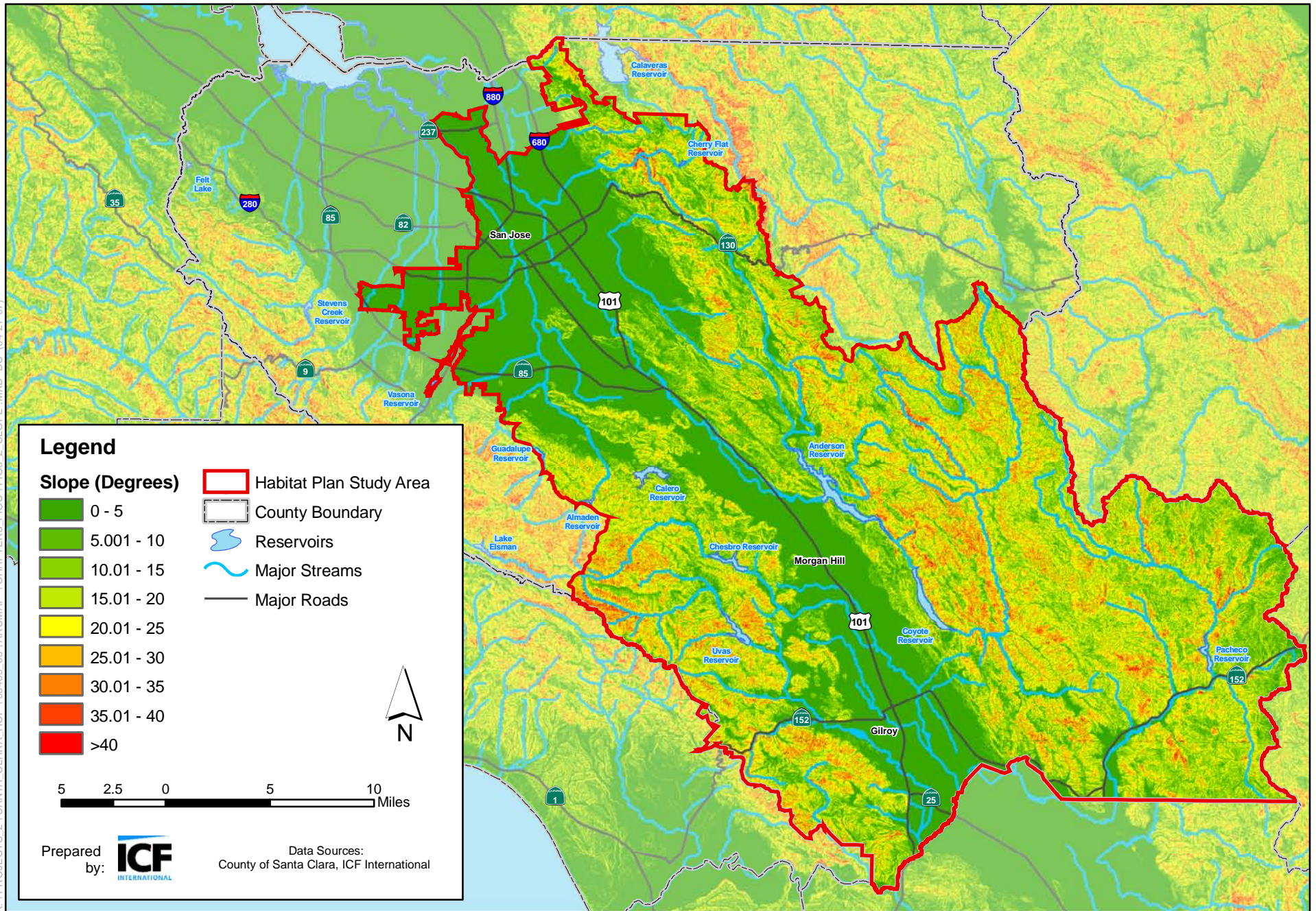
See Chapter 3 for definitions of fish communities and **Figure 3-11** for locations.

Source: Habitat Plan Science Advisors Report (Spencer et al. 2006).

**Figure 3-1**  
**Santa Clara Valley HCP/NCCP Topography**

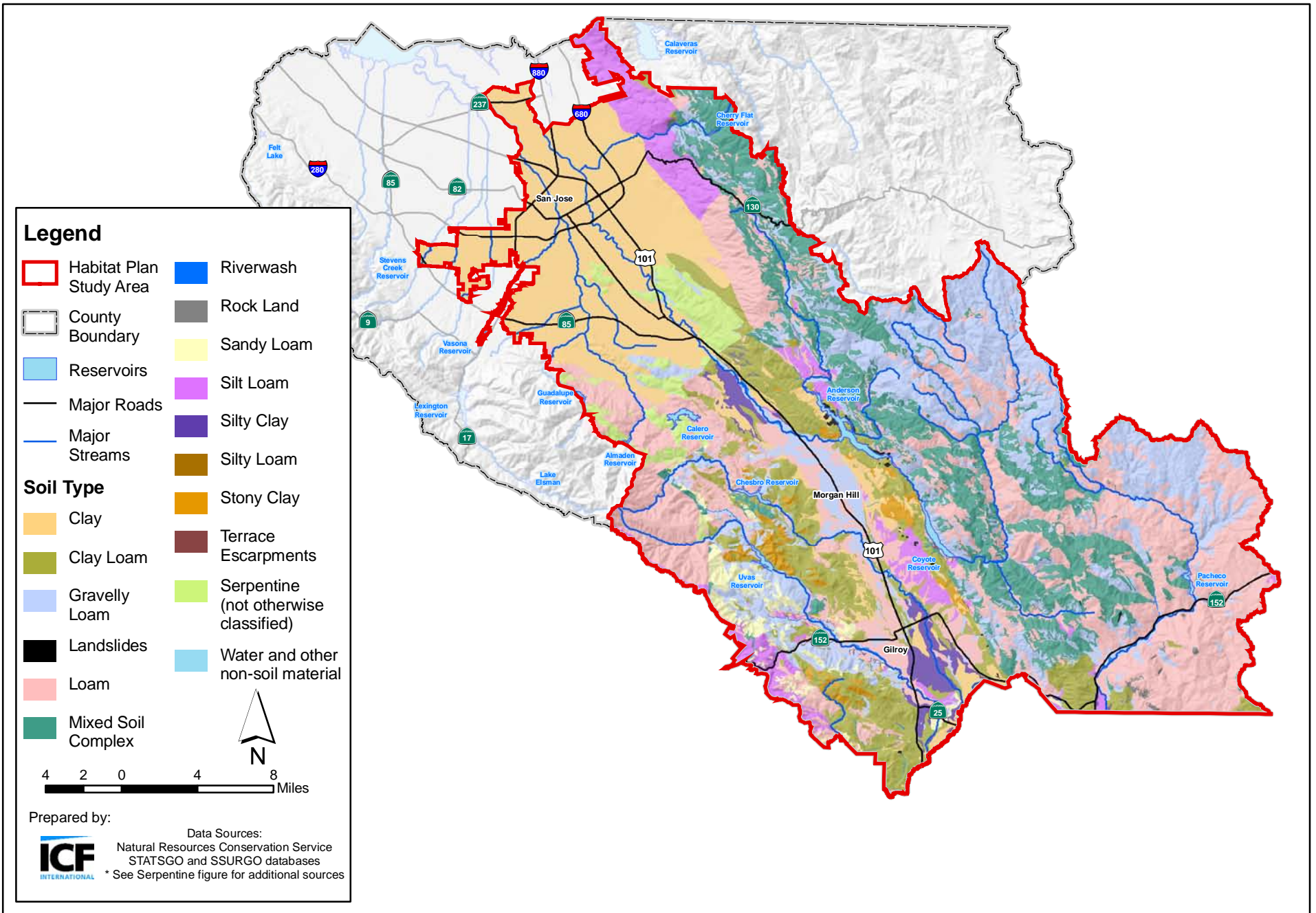


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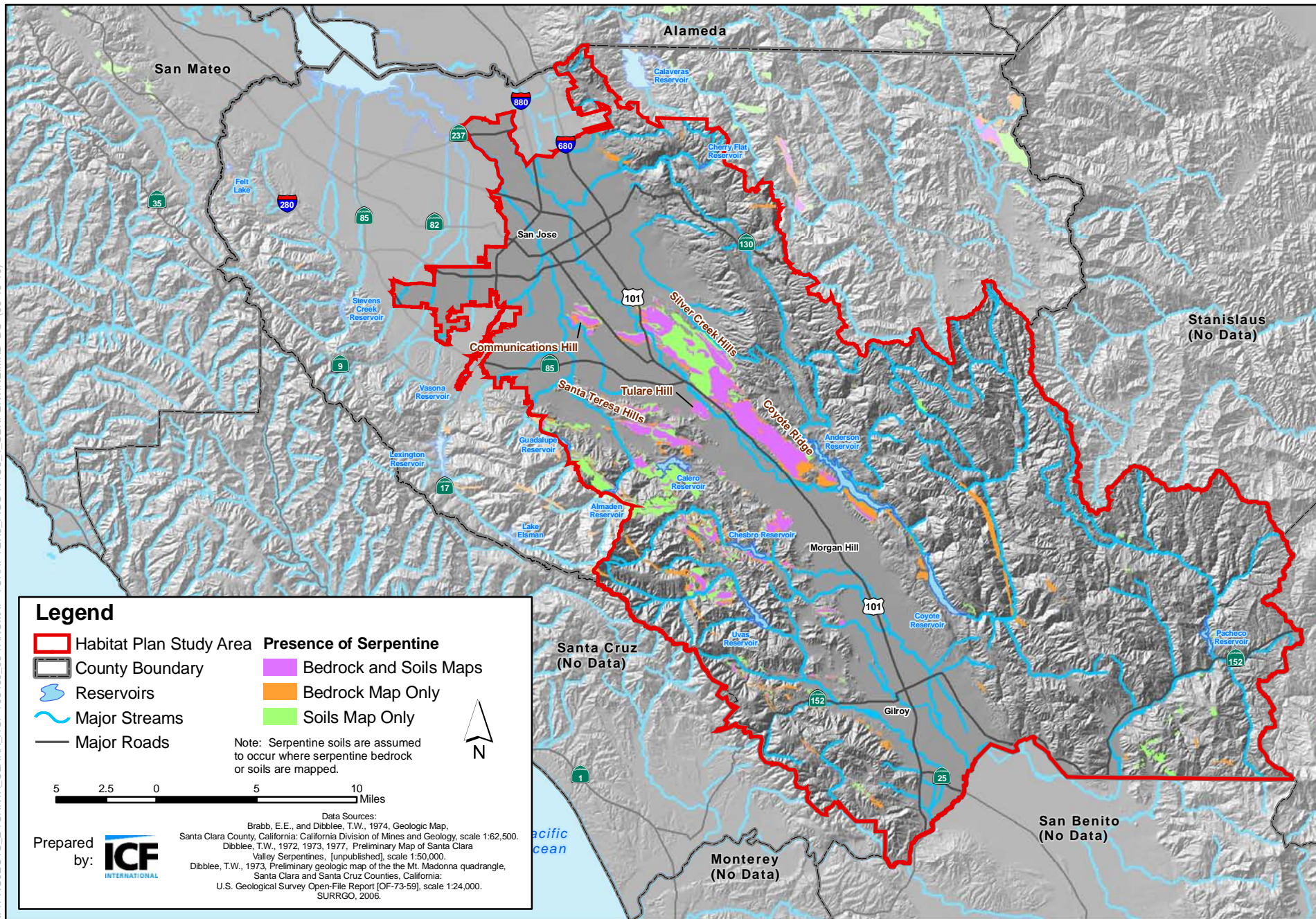
**Figure 3-2**  
**Santa Clara Valley HCP/NCCP Slope in Degrees**





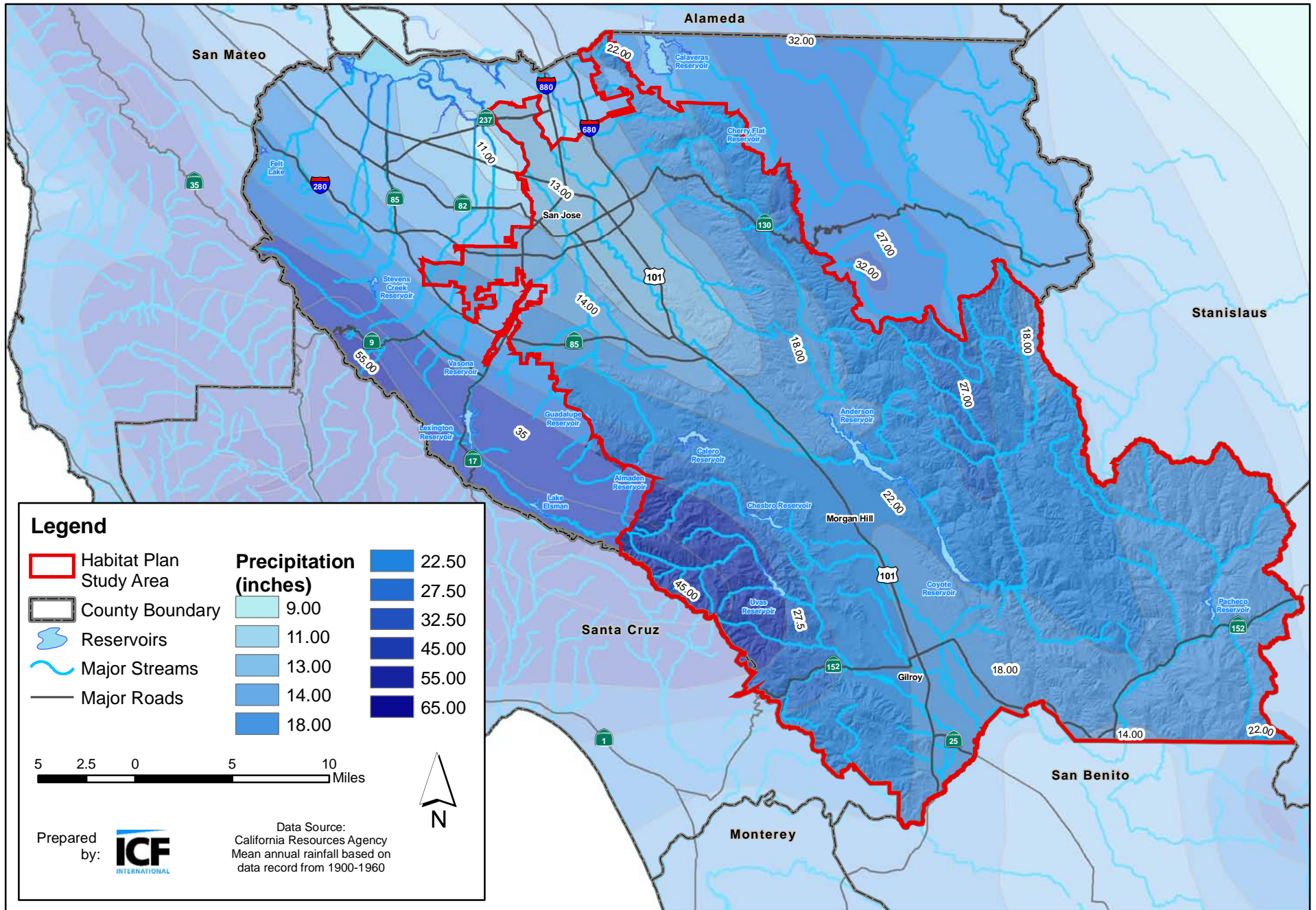
**Figure 3-3**  
**Soils in the Santa Clara Valley HCP/NCCP Area**





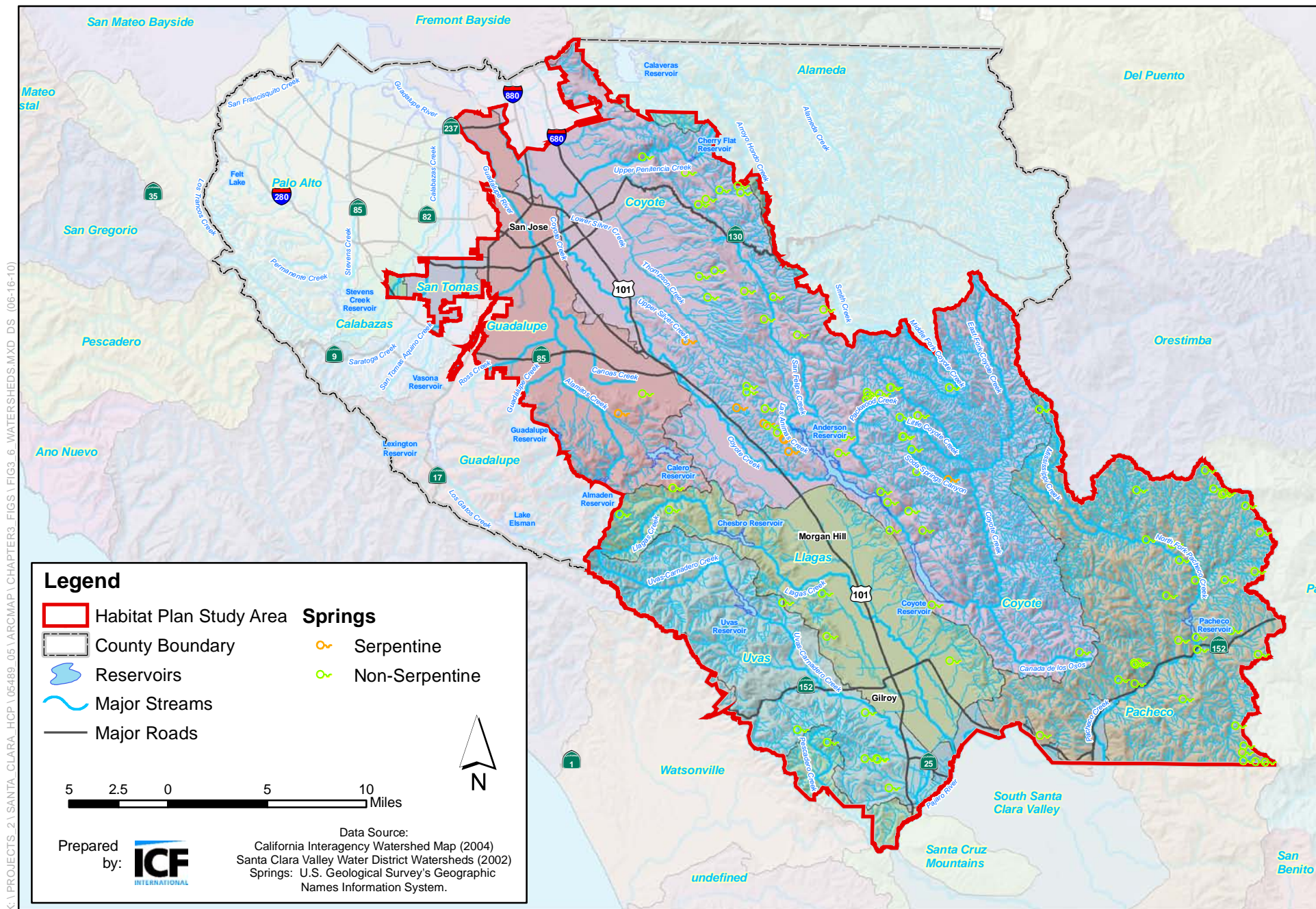
**Figure 3-4**  
**Santa Clara Valley HCP/NCCP Serpentine Areas**



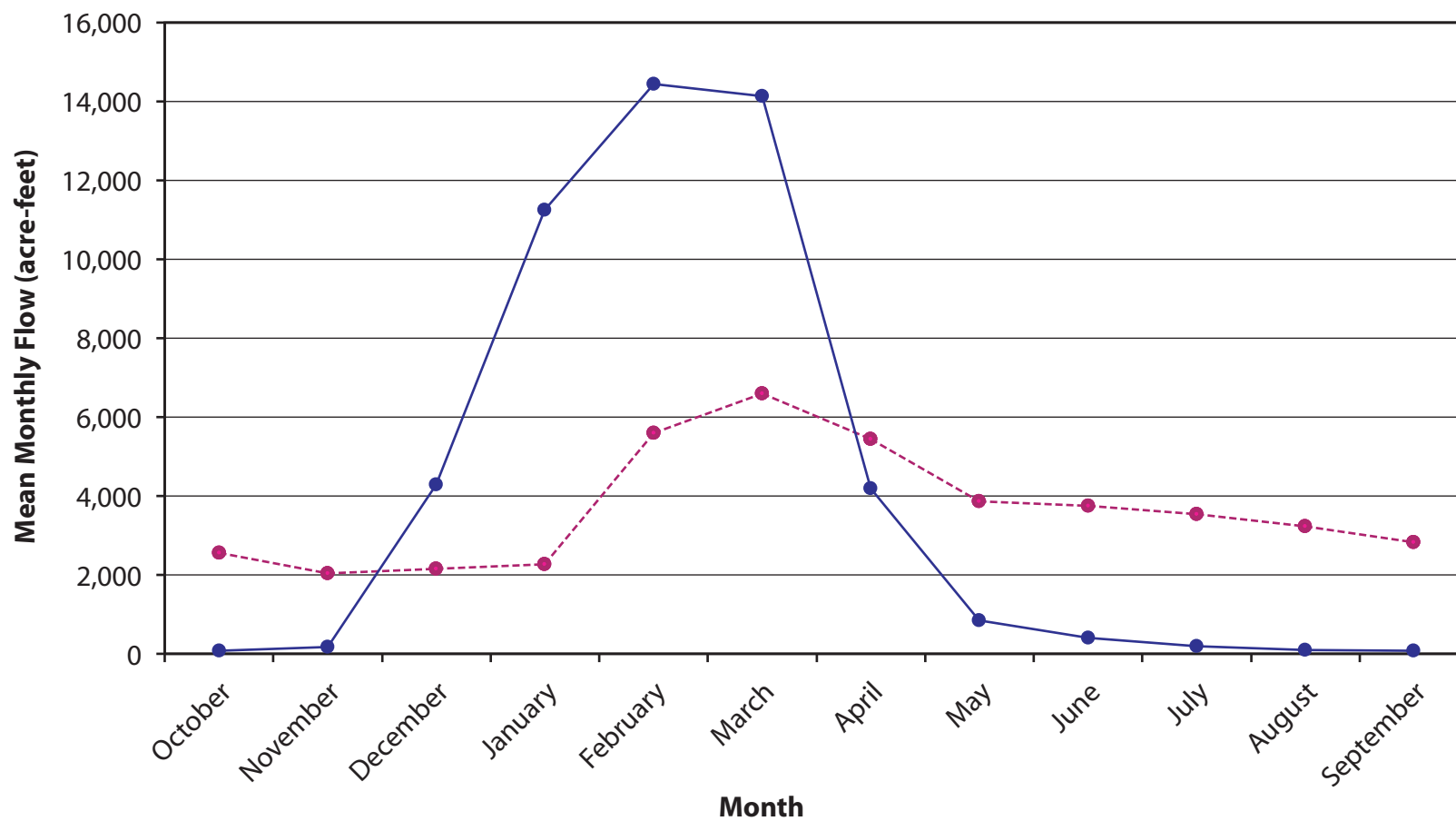


**Figure 3-5**  
**Average Annual Rainfall in HCP/NCCP Study Area**





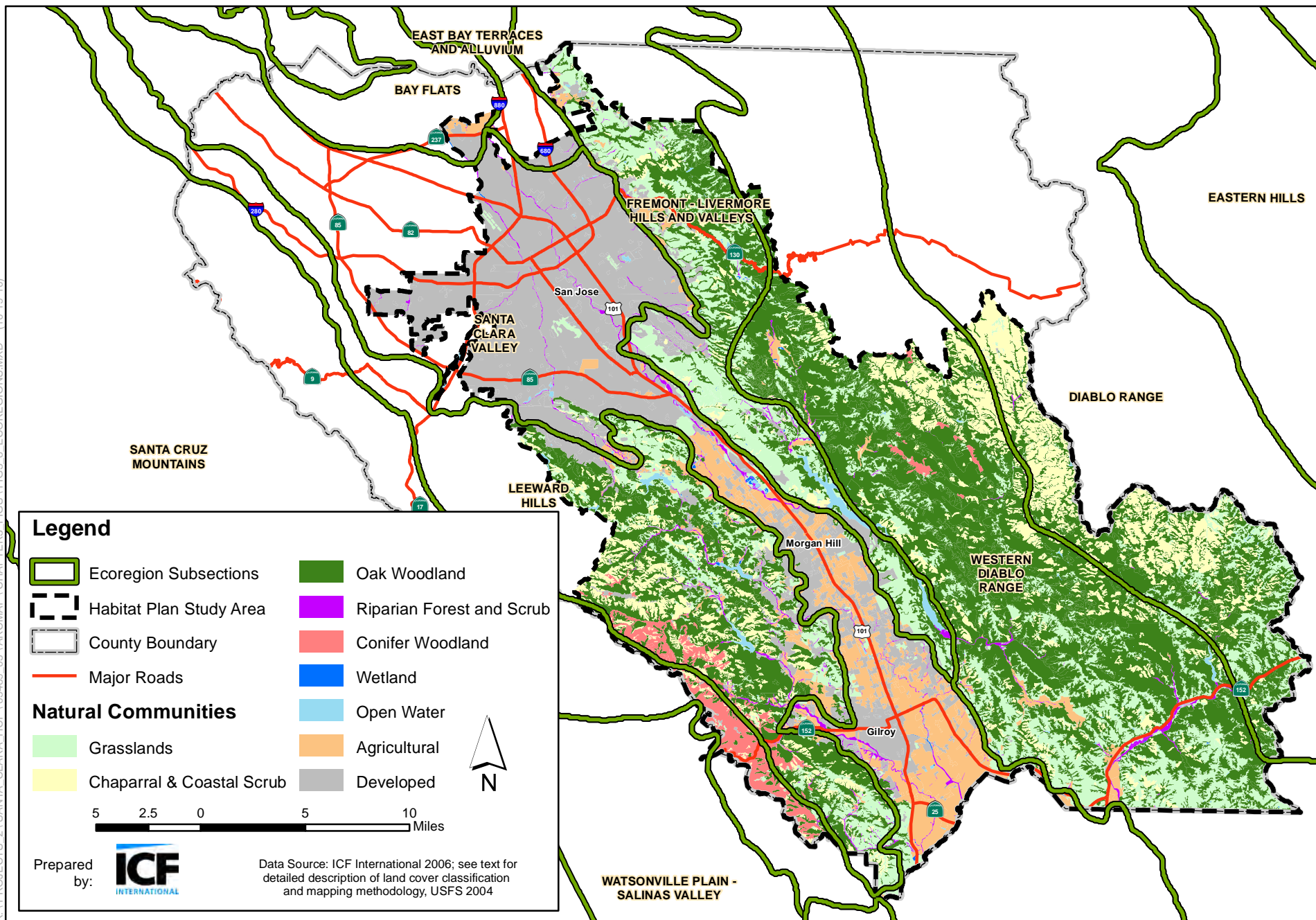




Source: California Department of Water Resources 2006.

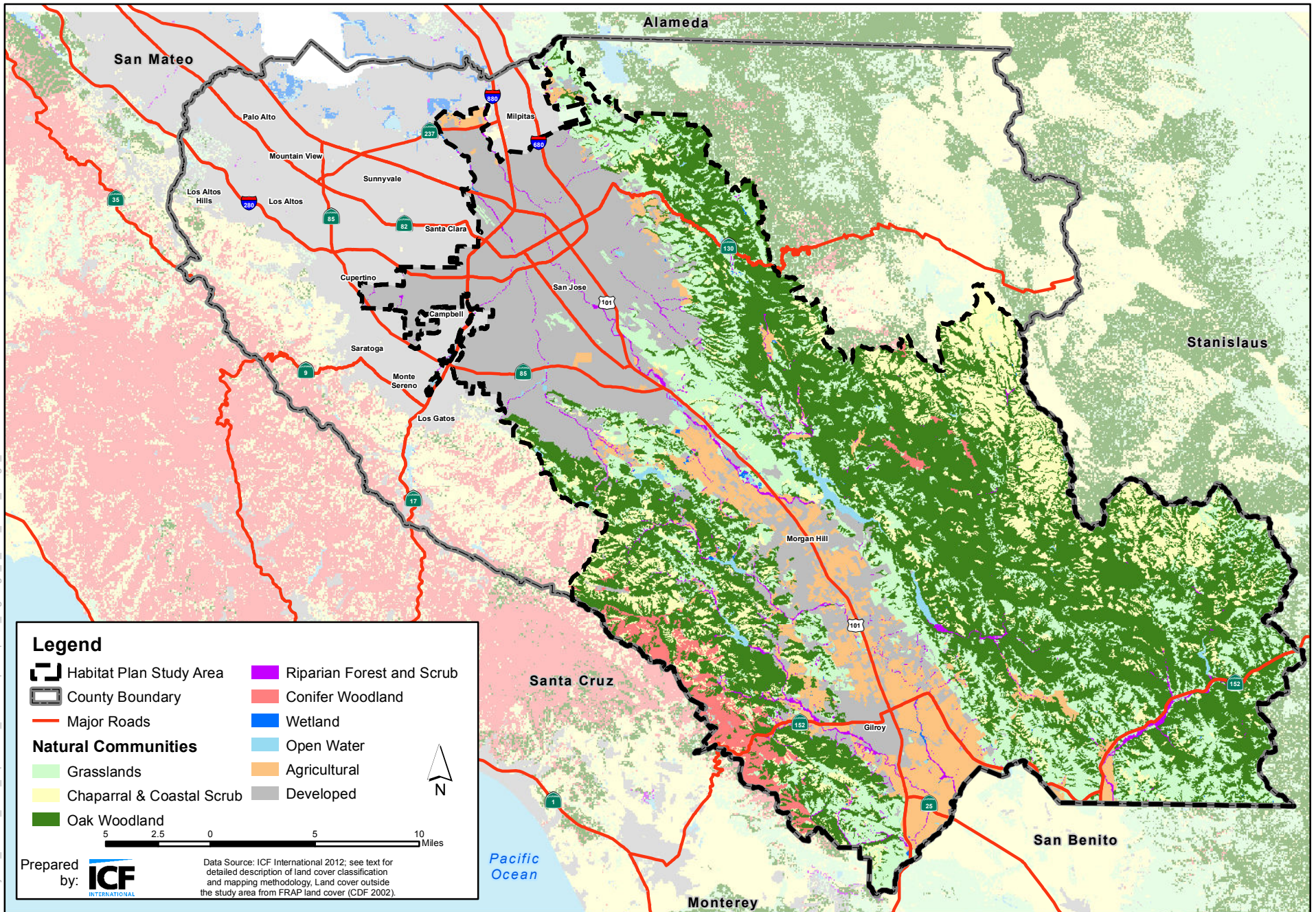
Available: [http://cdec.water.ca.gov/cgi-progs/selectQuery?station\\_id=cyo&sensor\\_num=&dur\\_code=M&start\\_date=01%2F01%2F1901&end\\_date=now](http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=cyo&sensor_num=&dur_code=M&start_date=01%2F01%2F1901&end_date=now). Accessed: September 13, 2006.

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**Figure 3-8**  
**Santa Clara Valley Habitat Plan Natural Communities**  
**and USDA Ecoregion Subsections**

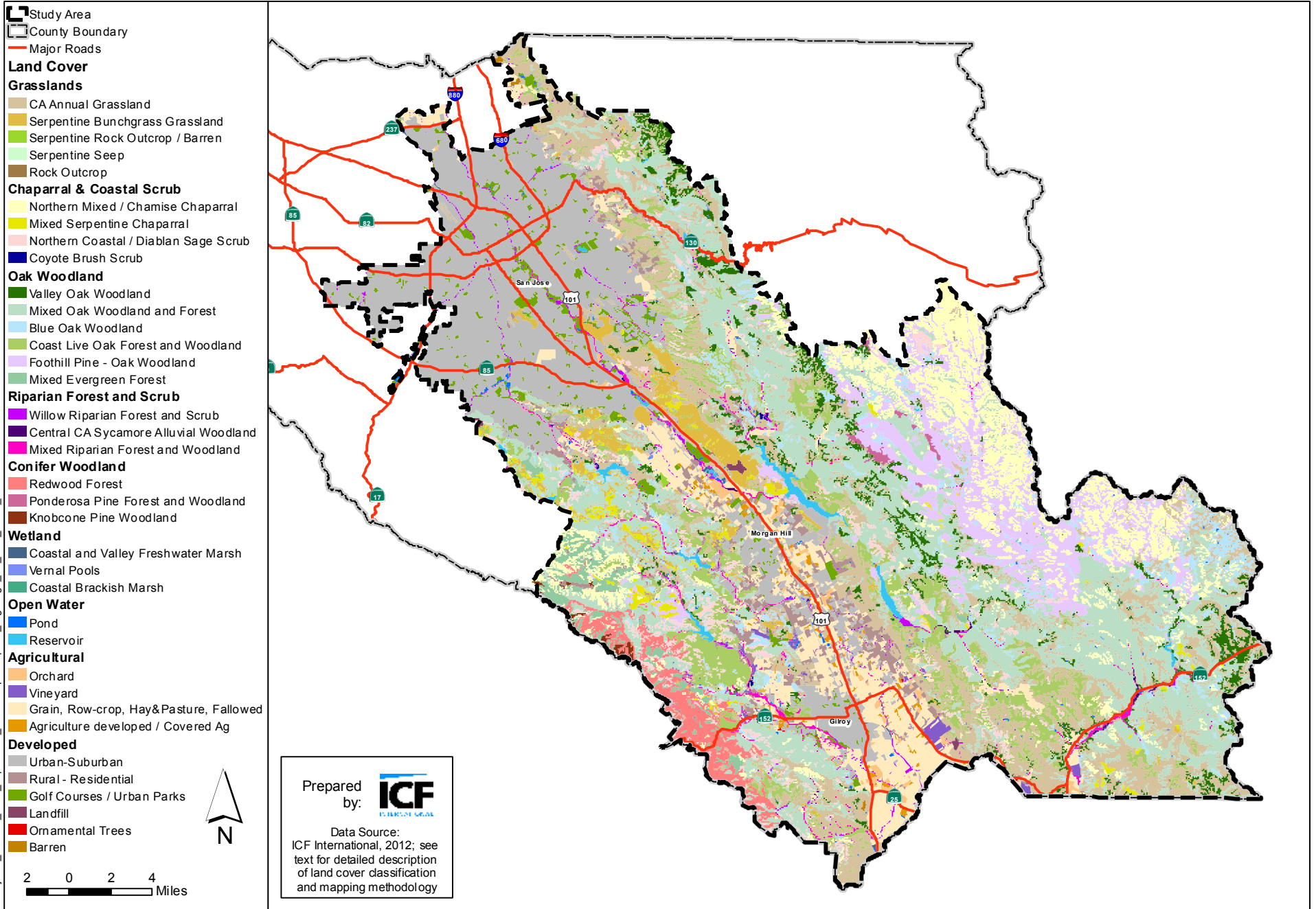




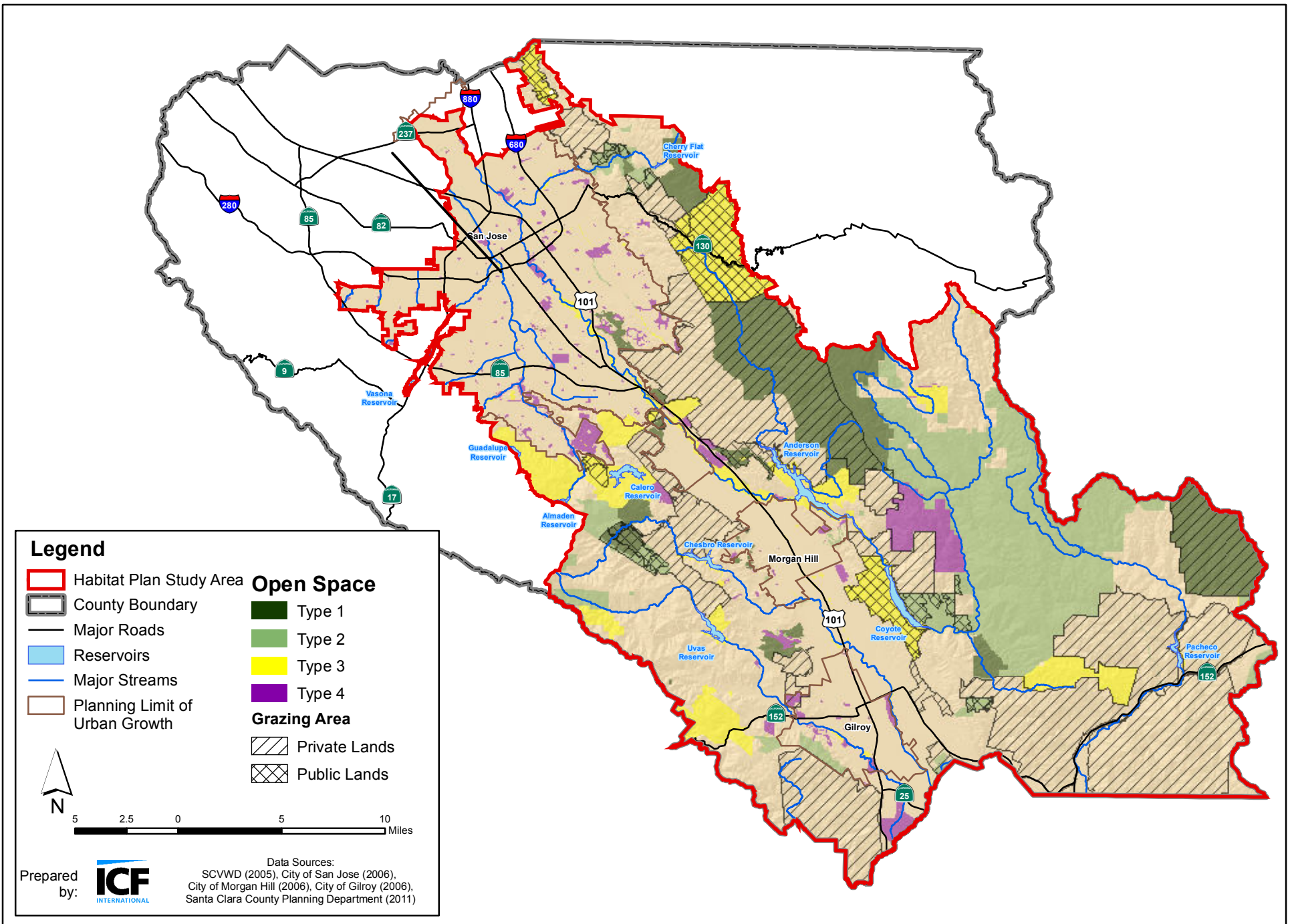
**Figure 3-9**  
**Santa Clara Valley Habitat Plan Natural Communities**



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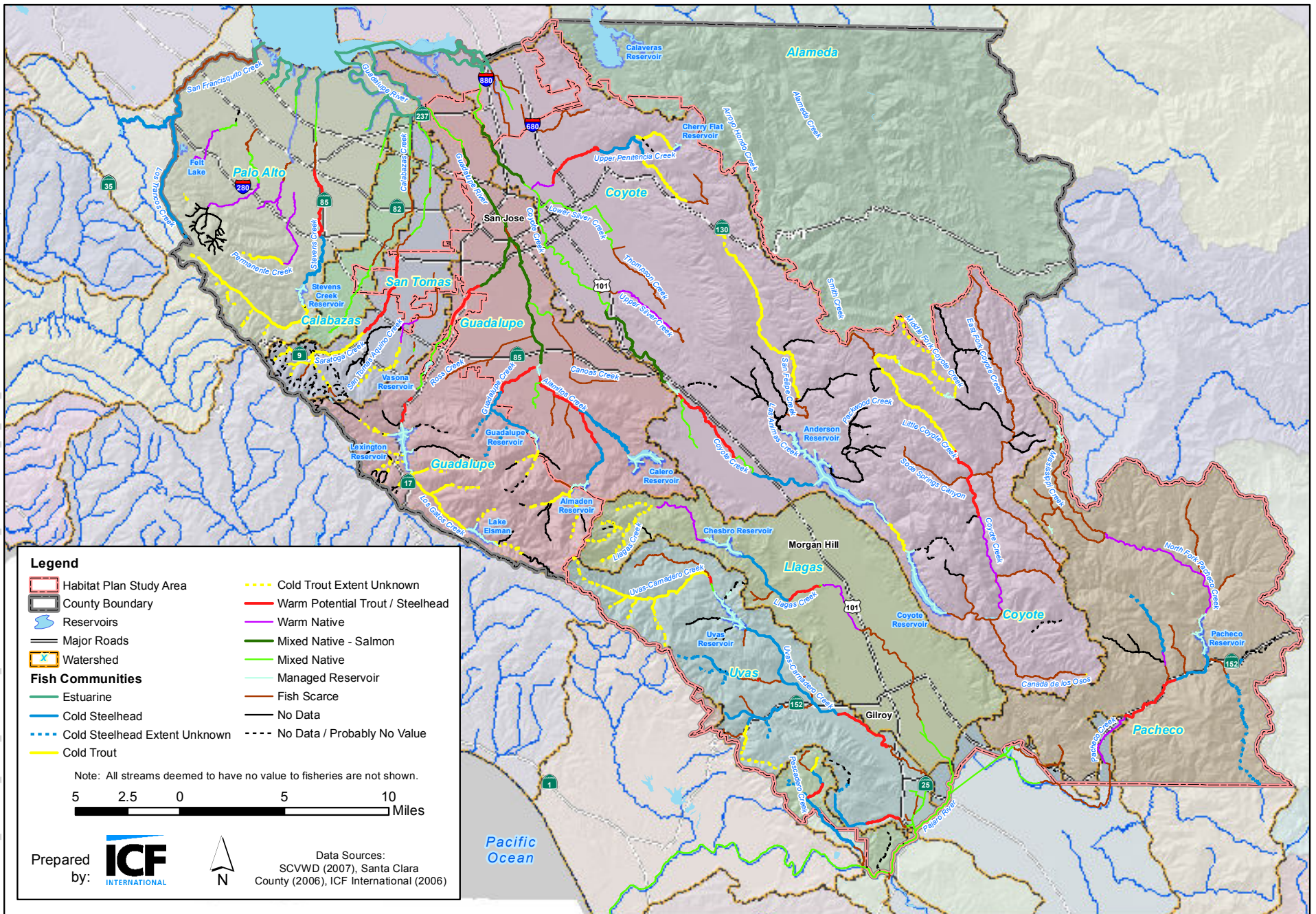


**Figure 3-10**  
**Santa Clara Valley Habitat Plan Land Cover**



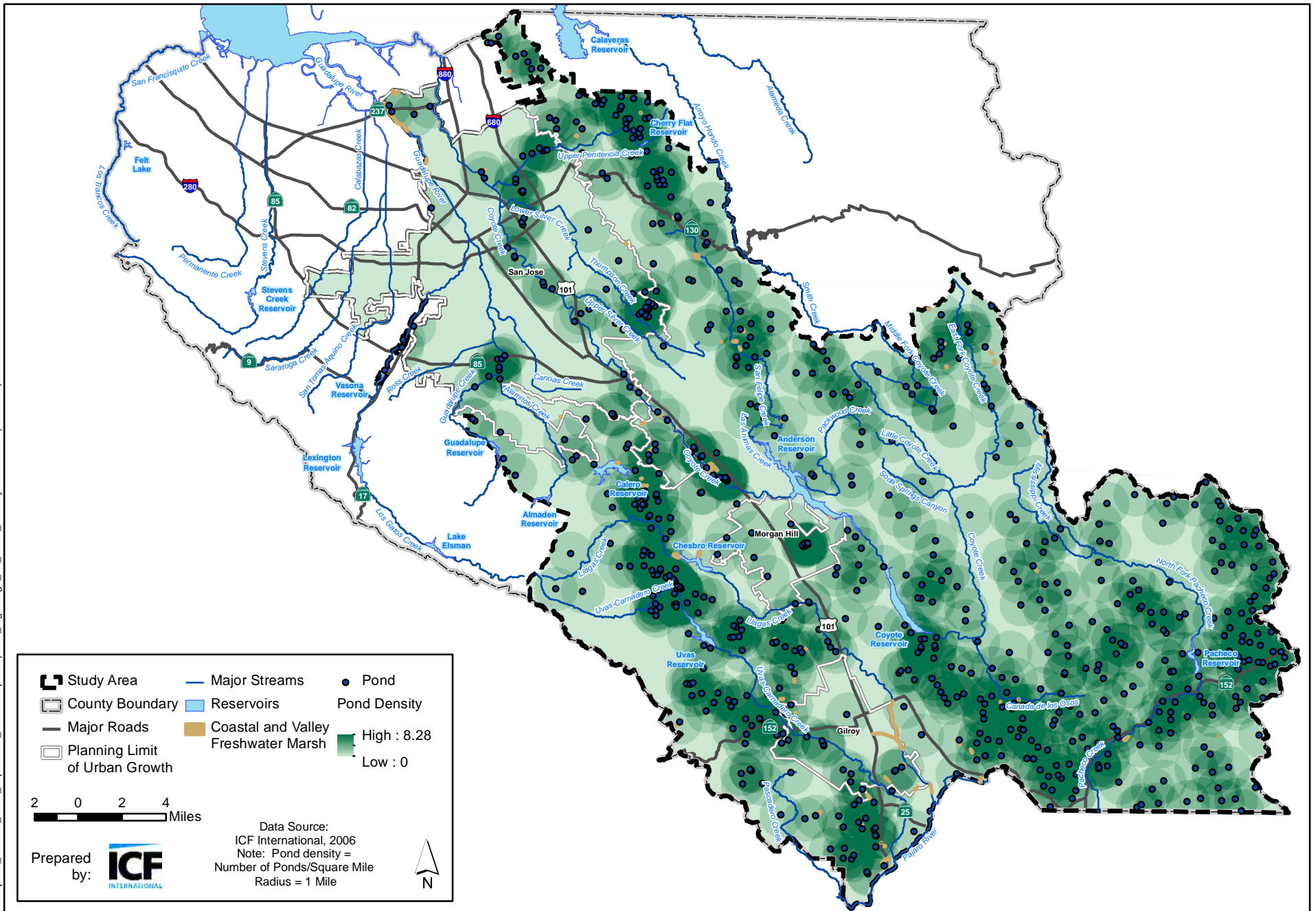
**Figure 3-11**  
**Extent of Grazing in the Study Area**





**Figure 3-12**  
**Fish Communities in the Study Area**





**Figure 3-13**  
**Pond Density in the Study Area**





## Chapter 4

# Impact Assessment and Level of Take

### 4.1 Introduction and Approach

This chapter addresses the effects of the covered activities described in Chapter 2 *Land Use and Covered Activities* on covered species and natural communities. Direct impacts are assessed quantitatively; indirect impacts are assessed qualitatively. The cumulative effects of projects in or near the study area and impacts on critical habitat are also analyzed.

The approach to analyzing impacts was by necessity a programmatic one. Because the Plan is large in geographic scope, broad in the range of activities covered, and long in terms of the duration, the impact assessment represents approximate impacts rather than precise numbers. Therefore, the acres of impacts presented in this chapter represent total impacts allowable under the Plan. Fees will be paid, in part, based on actual impacts to land cover types as determined during Plan implementation.

The impact analysis was based on the seven major categories of covered activities described in Chapter 2 and listed below.

- Urban Development.
- In-stream Capital Projects.
- In-stream Operations and Maintenance.
- Rural Capital Projects.
- Rural Operations and Maintenance.
- Rural Development.
- Conservation Strategy Implementation.

### 4.2 Definitions

The terms below are defined for the purposes of this Plan.

*Impacts* are those actions affecting biological resources, specifically undeveloped land cover types and covered species, in the permit area. Impacts can be direct or indirect; they can also be cumulative.

*Direct impacts* are defined as activities or projects that remove or alter land cover types, or covered species habitat, populations, or occurrences (or portions of thereof). Direct impacts are caused by the project and occur at the time and place of project implementation (e.g., ground disturbance, inundation). Direct impacts can be either permanent or temporary (see definitions of permanent and temporary impacts immediately below).

*Permanent impacts* are direct impacts that permanently remove or alter a land cover, or that affect a land cover for more than one year during covered activity implementation and/or more than one year after completion of the covered activity (e.g., creating a new road through grassland). Permanent impacts also include indirect impacts to wetlands that result in a permanent (i.e., more than one year after completion of the covered activity) change to wetland functions (e.g., development around a wetland that reduces the surface water supply to a wetland that subsequently results in a reduction in the size of the wetland). Impacts that result in reduction of long-term viability of a plant occurrence are also considered permanent.

*Temporary impacts* are direct impacts that alter land cover for less than one year and that allow the disturbed area to recover to pre-project or ecologically improved<sup>1</sup> conditions within one year (e.g., prescribed burning, construction staging areas) of completing construction. For the purposes of this Plan, all impacts associated with covered activities that have a duration exceeding one year or that take more than one year to restore immediately following construction will be considered permanent.

*Indirect impacts* are defined by USFWS as “those that are caused by the proposed action and are later in time, but are still reasonably certain to occur” (50 CFR 402.02). Indirect impacts in the context of this Plan also include those impacts that occur at the time of the proposed action but beyond the footprint of a project or activity (i.e., beyond the area of land cover disturbance). While more difficult to detect and track, indirect impacts can undermine species viability or habitat quality, especially if multiple indirect or direct impacts work cumulatively to impair the species or to degrade the habitat. Indirect effects that would result from activities permitted by this Plan are listed in **Table 4-1**. This table summarizes the major categories of indirect impacts that could affect each covered species.

*Cumulative impacts* result from the proposed actions’ incremental impact when viewed together with past, present, and reasonably foreseeable future actions. Cumulative impacts are defined under both the ESA and NEPA. HCPs do not require a discussion of cumulative effects as analyzed under NEPA. However, as stated in the HCP handbook, “the applicant should help ensure that those considerations required of the Services by Section 7 have been addressed in the HCP” (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996:3–15). Accordingly, the Plan addresses the cumulative effects of public or private activities that could result from individually minor but collectively

<sup>1</sup> *Ecologically improved* means that the site functions ecologically better than the functions present on the site prior to ground disturbance.

significant actions that take place over time. Cumulative effects of all projects with a federal nexus will be analyzed under NEPA and will not be addressed in the Plan in accordance with the ESA regulatory guidelines.

The following section discusses specific impact mechanisms for each of the major categories of covered activities.

## 4.3 Impact Mechanisms

In the following discussion, impact mechanisms are grouped for the purposes of analysis and in accordance with the description of covered activities presented in Chapter 2. Unlike Chapter 2, which provides details on the activities themselves, this section provides a description of how these groups of covered activities affect land cover and habitat for covered species. These descriptions provide an overview of the direct and indirect effects that are likely to result from the categories of covered activities. Impact estimates by acres of land cover affected or miles of stream are discussed in Section 4.5 *Effects on Natural Communities/Land Cover* and Section 4.6 *Effects on Covered Species*. Conditions on covered activities that will reduce the impacts described below are presented in Chapter 6 *Conditions on Covered Activities and Application Process*. Avoidance and minimization measures in this Plan (Chapter 6) are designed to minimize injury or death of all covered species during construction and to avoid injury or death of San Joaquin kit fox, western burrowing owl, tricolored blackbird, and least Bell's vireo.

### 4.3.1 Urban Development

Urban development is one of the primary impact mechanisms considered in this Plan, accounting for approximately 60% of all impacts assessed in this Plan. The major impact of new urban development is conversion from undeveloped to developed land cover types. In addition to the net loss of undeveloped land cover in the permit area, such conversion may further isolate remaining natural habitat within the planning limit of urban growth, rendering it less suitable or unsuitable for covered species. Riparian and in-stream impacts may also occur as a result of urban development; however, these impacts are described and assessed under the categories of In-Stream Capital Projects and In-Stream Operations and Maintenance Activities.

Urban development is assumed to result in permanent direct impacts because it is assumed that complete conversion of natural land cover types would occur at project sites in urban areas. Accordingly, no temporary direct impacts on land cover are expected to result from this impact type within the planning limits of urban growth.

Urban development will have indirect effects on biological resources in protected open space within and outside the planning limits of urban growth, including the Reserve System. One significant indirect impact is nitrogen deposition on the

local serpentine grassland community resulting from increased traffic associated with new development. The predicted increase in local and regional vehicular traffic may also result in increased disturbance of covered species in the permit area and loss of covered species from vehicular collisions. An assessment of the impact of nitrogen deposition on natural communities and covered species is presented in Section 4.5.2 *Indirect Effects*.

By increasing the extent of impermeable surfaces, urban development contributes to increased runoff, especially during storm events. Such increases can result in greater levels of scour and/or incision of local creeks, increased sediment loads, alterations of downstream hydrology, and decreased groundwater recharge. Also, addition of new development may increase the amount of pollutants such as grease, oil, and lawn pesticides that can be transported from residences during wet weather. An increase in the quantity of pollutants reaching local creeks through higher runoff may affect the biological and physical characteristics of aquatic habitats. Pollutants can also enter groundwater when development occurs over percolation zones in streams, such as in Coyote Valley. This can affect drinking water quality. In addition, if shallow, “perched” water tables occur, this groundwater can be discharged to surface water as part of summer stream flow (such as in the lower Guadalupe River or lower Uvas Creek). However, design guidelines (see Chapter 6) require construction in urban and rural areas to manage runoff so that existing runoff conditions (i.e., rate of runoff) are maintained and to reduce pollutants entering local streams. High runoff temperature may also result in an increase of in-stream water temperatures when runoff enters local streams. Increased impermeable surfaces may also inhibit natural percolation of stormwater into groundwater basins which may lead to a drawdown in ground water levels. Changes from reduced percolation of runoff are expected to be relatively minor as SCVWD operates several groundwater recharge basins and also extracts water to support local water supplies.

Indirect beneficial impacts to local streams may occur as recycled water is increasingly utilized for urban uses (e.g., landscaping) in place of surface and groundwater. This may result in temporary reductions of in-stream withdrawals, although by the end of the permit term it is likely that all water resources (local, imported, and recycled) will be fully utilized. Increased discharges from water treatment plants may also help to supplement in-stream flows from reservoir releases to support aquatic covered species.

Several other indirect impacts may be expected as urban development increases the human population of the permit area. General use of the study area, including units of the Reserve System where certain types of recreation are allowed, will increase. Increased human use within the permit area may have adverse effects on biological resources in the form of collection and harassment of native species, introduction or spread of diseases, competition from or predation by nonnative species, trash dumping, higher noise levels, increased light pollution at night, spills of hazardous materials, water quality degradation from road runoff, and increased frequency of wildfire ignitions (**Table 4-1**). Incidental take associated with legal recreational uses is only extended to the Local Partners for the indirect effects of allowable recreational uses (take caused by actions of

individual recreationalists is not covered). The level of incidental take of recreational use is assumed to be too minimal to measure and thus is not accounted for in the impact assumptions described below in Section 4.4 *Impact Assessment Methods*. Recreational impacts are greatly minimized by Condition 9, described in Chapter 6, *Conditions on Covered Activities and Application Process*. Impacts are mitigated through the conservation strategy as a complete package that includes conservation associated with contributions to recovery of covered species.

Human population growth can exacerbate the introduction or spread of nonnative species. Nonnative aquatic wildlife is known to have serious impacts on native amphibian populations. For example, aquarium species released in the wild may introduce new diseases to wild amphibian or fish populations. Feral cats pose a serious threat to native birds, especially those that nest on or near the ground, as well as to native reptiles. They can also cause a shift in small mammal populations from native to nonnative species. Ornamental plants and native cultivars<sup>2</sup> may spread to adjacent protected areas and outcompete and displace native species; they can also hybridize (interbreed) with local native plants and thereby disrupt the genetics of the native population. Such hybridization can cause a number of problems for the native plant population, including poor growth and reproduction.

The final locations of Plan reserves are not known, but some reserves are expected to be near or adjacent to urban areas. The Plan conservation strategy includes measures to minimize some of the foregoing indirect effects through actions such as development of design guidelines that reduce impacts from development on natural lands. Additionally, outreach programs for the public, especially landowners, renters, and developers, will educate the local populace on these threats and on ways that they can help minimize them. Despite these measures, it is assumed that indirect effects will occur. Most of the indirect impacts of urban development will occur along or near the boundary between new urban development and new reserves. Because the urban areas are relatively consolidated, this boundary zone will be a comparatively small portion of the total Reserve System. **Table 4-1** lists the major categories of these indirect impacts; these impacts may be particularly pronounced at the urban-wildland interface.

## 4.3.2 In-Stream Capital Projects

Several types of projects will have impacts on in-stream resources. These are discussed below. While some trail construction will occur across streams or in riparian areas, the majority of trails will be designed to avoid these sensitive areas. Accordingly, impact mechanisms for trail construction are discussed in Section 4.3.4 *Rural Capital Projects*.

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<sup>2</sup> Native cultivars are plants cultivated from native species and bred for specific characteristics; they have lost the original genetic diversity of the species or population from which they were derived.

## Flood Protection Capital Projects

Final designs of flood protection projects described in Chapter 2 are not known at this time. However, conceptual designs have been developed for several projects including Berryessa, mid-Coyote, and upper Penitencia. In addition, SCVWD has completed flood protection projects on the lower Guadalupe River (Santa Clara Valley Water District 2002), the Guadalupe River in downtown San José (Santa Clara Valley Water District 2001), and the upper Guadalupe River (Santa Clara Valley Water District 1999a, 1999b). Conceptual project elements, as well as completed project designs, were used to inform the impact mechanisms described below.

In accordance with SCVWD's Clean, Safe Creeks and Flood Protection Plan, the projects identified for coverage under this Plan include design elements to preserve sensitive natural communities using a mix of setback levees and floodwalls, minimize the use of concrete, protect riparian and wetland environments with revegetation mitigation projects, protect water quality and limit turbidity using sediment control structures, and provide recreational access.

Flood protection projects in the study area are implemented by SCVWD. SCVWD seeks to balance flood control requirements with the habitat needs of riverine and riparian species. This goal is reflected and supported by the Clean, Safe Creeks and Flood Protection Plan, described in Chapter 2, which is focused on four outcomes for projects in local streams: providing flood protection, protecting water quality, enhancing and restoring in-stream and riparian ecosystems, and providing recreational access. Whenever possible (e.g., undeveloped land is available along the outside of the existing levee) and economically feasible (i.e., funding for implementing a large levee reconstruction can be secured), environmentally sensitive design treatments such as levee setbacks and naturalized structural improvements are used instead of channelizing streams in concrete. An example of such an approach is proposed for Berryessa Creek, where banks of the existing channel will be set back and an in-channel floodplain developed to allow the creek more "elbow room" to allow meandering and natural stream hydraulics. Such methods help offset impacts from increased runoff (described above) by reducing flow velocity and increasing roughness, especially during storm events.

However, flood protection projects will sometimes result in some permanent impacts associated with the use of hardscape where naturalized alternatives are not feasible, as well as some temporary impacts associated with construction. The type and severity of both permanent and temporary impacts will vary considerably depending on the scope of specific projects.

Permanent and temporary impacts, both direct and indirect, are expected to occur during implementation of flood protection projects. Riverine and riparian habitat may be permanently affected both during and after construction. Review of the upper and downtown Guadalupe River EIRs reveals a 27% and 50% total impact (i.e., both permanent and temporary), respectively, on riparian and in-stream habitat during project construction (Santa Clara Valley Water District 1999a, 1999b, 2001). Based on these past impact evaluations, and input from SCVWD

engineers regarding current conceptual plans for future projects, some permanent loss of land cover is expected during implementation of covered activities. These permanent losses to land cover types excluding streams are anticipated to average 20% of the total project footprint. Temporary impacts to land cover are anticipated to be approximately an additional 20% of the total project footprint. Permanent impacts will be assessed for loss of natural land cover types that are impacted longer than the time allowed for temporary impacts (defined in Section 4.2 *Definitions*). However, site design for flood protection projects often includes elements to replace and/or improve habitat on site as part of SCVWD's goal of balancing flood protection and habitat value. SCVWD may receive restoration credit for such actions as described in Chapter 9, Section 9.4.1 *Habitat Plan Fees* subheading *Aquatic Restoration or Creation Provided in Lieu of Wetland Fee*. Permanent land cover loss may be attributed to installation of hardscape on the channel bed and banks; installation of levee walls, access roads, and outlet and inlet structures; off-channel detention basins; maintenance road construction; and increased recreational use. Impacts associated with off-channel detention basins fall outside of in-stream areas but within the planning limit of urban growth and as such, impacts are assumed as part of the urban development analysis. Access roads associated with flood protection projects may also be designed for use as recreational trails. Because permanent, direct impacts to land cover associated with such trails are already accounted for through the design of access roads, no additional permanent impacts are anticipated. However, it is possible that indirect and temporary impacts may occur through recreational use (e.g., increased harassment resulting from recreationists or dogs). In addition, changes in sediment transport and deposition within the channel due to channel realignment and changes in channel substrates may occur. Loss of in-stream complexity due to installation of hardscape or channel straightening could lead to increased scour along earthen channels.

Direct, temporary impacts of flood protection projects are most likely to occur during construction when use of heavy equipment may entail loss of vegetation for access, and increased turbidity, in-stream temperature, dust, and noise. Most, if not all, flood protection projects are likely to require dewatering of portions of the channel during construction. These activities will result in temporary reduction in habitat quality and/or loss of habitat, including potential impacts to covered avian species using riparian habitat for nesting. However, most temporary construction impacts can be avoided or minimized through the appropriate use of avoidance and minimization measures (see Chapter 6). Temporary impacts are also likely to occur at staging areas used during construction. Existing developed areas such as access roads or adjacent parking lots will be targeted for use as staging areas. If such areas are not available, highly disturbed ruderal areas will be selected. Staging will not be established in sensitive areas such as stream beds, riparian, or serpentine areas.

Indirect impacts on groundwater may occur if the channel bed is altered to prevent infiltration of flows (e.g., through installation of concrete). The construction of new levees could also prevent streams from naturally meandering, which could lead to channel incision and erosion. Continued use of groundwater recharge ponds and construction of new ponds as described in Chapter 2 may help offset any changes to groundwater levels that could occur

due to installation of flood protection projects. Installation of flood protection projects is not expected to result in significant changes to in-stream flow or velocity. The effects of straightening channels are better understood today than in the past, and new flood control structures will be designed to mimic natural flow conditions as closely as possible. Where hardened elements are required, appropriate flow dissipation devices will be incorporated into the design to prevent flows from increasing to the point that fish cannot move upstream or are washed downstream. In addition, as described above, flow bypass channels may be installed to reduce excessively high flows during storm events that cause erosion in earthen channels.

## **Levee Reconstruction**

Direct, permanent impacts will occur when levees are reconstructed and then maintained in accordance with FEMA and Corps guidelines. Since the events of hurricane Katrina, FEMA and the Corps have tightened rules on how levees must be maintained for flood protection purposes. SCVWD currently conducts vegetation management on these levees under the Stream Maintenance Program and vegetation management follows the Corps guidelines.

It is expected that once reconstructed, levees will be maintained under the Stream Maintenance Program free of all vegetation with the exception of grasses and non-woody shrubs. Therefore, all non-ruderal vegetation is assumed to be permanently lost once reconstruction is complete. SCVWD will avoid areas that were developed for mitigation of previous projects. Most levees will be reconstructed in the same footprint as existing levees. However, where space allows (i.e., where development does not encroach up to the outer edge of the levee), there may be opportunities to set back the levees and create a wider floodplain area that is permitted to support trees and other riparian vegetation.

Direct, temporary impacts may occur during levee construction similar to those associated with flood protection project construction. Similarly, the proper use of avoidance and minimization measures can greatly avoid and minimize construction-related temporary impacts.

Indirect impacts associated with levee reconstruction may include a reduction of in-channel cover and/or woody debris that occurs over time due to a reduction in streamside riparian vegetation. Reconstruction of levees is not expected to result in changes to in-stream flow or velocity because levees will be reconstructed similar to their original designs.

## **Canal Reconstruction, Realignment, and Decommissioning**

SCVWD anticipates needing to fully reconstruct or decommission all of its water conveyance canals over the course of the permit term. Canals may be reconstructed in place, replaced with a pipeline installed within the alignment of



the existing canal footprint, replaced within different alignment that is also within a public right-of-way, or decommissioned. Reconstruction or replacement with a pipeline will require ground disturbance and complete vegetation removal within the entire footprint of the canal. Reconstructed canals may allow some vegetation to reestablish in or along the canal; however, for the purpose of the impact analysis, complete loss of vegetation is assumed. Canals will not be flowing at the time of construction, thus there would be limited impacts to streams that are connected to the canals are expected as a result of reconstruction. Small, discontinuous wetlands may occur in canals that are fed by perennial seeps and springs. These wetlands and some covered species may be affected by canal reconstruction or installation of a pipeline and these affects will be considered impacts where they occur. Canal decommissioning may also have construction-related adverse effects when hardscape and other infrastructure are removed. However, removal of such infrastructure will also allow existing canals to return to a more natural state; thus resulting in long-term beneficial effects.

Direct impacts associated with canal reconstruction or installation of a pipeline would be similar to those direct impacts described for other construction projects including temporary increases in noise and dust. Implementation of avoidance and minimization measures described in Chapter 6 would reduce the potential for these types of indirect temporary impacts.

Decommissioning of a canal entails removal of unnecessary concrete and other materials from the site and allowing the canal to return to a more natural state. It is likely that decommissioning would enhance canals for natural resource management purposes, but credits for such enhancement are not assumed in the impact analysis. Minor indirect temporary impacts maybe associated with concrete removal activities. Canals will be dry at the time of removal activities, thus no impacts to streams that are connected to the canals are expected as a result of decommissioning.

## Three Creeks HCP In-Stream Capital Projects

The primary capital project associated with the proposed Three Creeks HCP is retrofit of five of SCVWD's six dams in the north portion of the permit area. These projects include the development of borrow sites to support dam retrofits as well as associated infrastructure to provide supplemental flows during a dewatering event. As such, the impact mechanisms associated with dam repair and seismic retrofit are described independently of the proposed Three Creeks HCP in the following section *Dam Seismic Safety Retrofit*. A supplemental water supply is proposed as part of the Three Creeks HCP Conservation Program. Impact mechanisms associated with this activity are discussed in Section 4.3.3 *In-Stream Operations and Maintenance*.

## Three Creeks HCP Conservation Program

The proposed Three Creeks HCP includes a suite of activities to enhance conditions for steelhead trout and Chinook salmon, while maintaining use of local watersheds to meet the water supply needs of northern Santa Clara County. The Three Creeks HCP Conservation Program includes nine main components that will receive take coverage under this Plan.

- Geomorphic Rehabilitation
- Almaden Reservoir Fish Passage
- Gravel Enhancement Program
- In-Stream Habitat Enhancement
- Fish Passage Enhancement
- Reservoir and Recharge Re-Operation
- Upper Penitencia Creek Management Program
- Supplemental Flow Program
- Monitoring Program

Geomorphic rehabilitation, Almaden Reservoir fish passage, gravel enhancement, in-stream enhancement, and the fish passage enhancement program are discussed below. Reservoir and recharge re-operation, Upper Penitencia Creek management, supplemental flows, and monitoring are described in Section 4.3.3 *In-Stream Operations and Maintenance* subheading *Three Creeks HCP Conservation Program*.

### Geomorphic Rehabilitation

The criteria for geomorphic rehabilitation ensure that affected reaches of the channels below the reservoirs will be substantially modified and improved in terms of factors such as channel sinuosity and riffle-pool habitat. Implementation of the proposed rehabilitations requires substantial construction. New channel will be graded, large woody debris will be added, and the channel will be replanted. During this process, the existing channel and most of the riparian habitat along the channel will be disturbed. During construction, flow will be bypassed around the construction site and there may be short term loss of stream habitat, including increased temperature in the water that is bypassed around the project site.

Geomorphic rehabilitation will sometimes occur within the current active channel and will have the beneficial effects of permanently separating pond habitats from riverine habitats and replacing existing slow-moving ponded areas with stream riffle-run-pool-run complexes.

### Almaden Reservoir Fish Passage

SCVWD proposes to provide steelhead with passage to upstream habitat that is currently blocked by Almaden Dam as part of the proposed Three Creeks Conservation Program. SCVWD has not yet identified a preferred alternative to

providing passage over Almaden Dam; however, SCVWD is currently considering a range of alternatives from trap and truck to construction of a fish ladder.

One of the goals of this program is to isolate juvenile salmonids emigrating downstream from the reservoir to reduce the potential for predation by exotic, predatory species living in the reservoir. As such, a juvenile collection facility may be constructed just upstream of the reservoir. Construction of this facility will require both on- and off-channel disturbance. Off channel disturbance will result in ground disturbance and permanent loss of some land cover types, as well as potential indirect impacts similar to those described in this chapter for other development projects. On-channel activities may result in a small amount of permanent stream loss where a diversion dam and fish screen are placed. Construction of the diversion dam will occur during the summer when natural inflows are at their lowest. Any remaining flows will be diverted around the project site as required by avoidance and minimization measures described in Chapter 6.

A trap and truck operation will have the least effect on covered species. This approach will utilize existing roads for moving fish from downstream of the dam to the upstream end of the reservoir. To trap adults, a collection facility at the base of Almaden Dam would be required. This activity could require a portable collection system placed in the channel. Access to the channel and staging for placement of the system may result in some permanent impacts to the stream bank and any riparian vegetation present. Access will be sited to avoid sensitive habitat to the extent feasible. This approach does not result in any changes to flows.

Construction of a fish ladder is likely to have the greatest effect on non-developed land cover types, including streams. Because the design of the project is not known, it is assumed that the ladder would not be designed as part of the existing dam infrastructure and would instead be constructed largely on non-developed land cover types. Depending on the level of separation of juvenile steelhead from the reservoir pool, a facility may be required to bypass fish around the dam and around the reservoir. If implemented, this facility would likely be constructed around the perimeter of the reservoir in non-developed land cover types. Ground disturbance impacts would be similar to other construction projects. Temporary construction impacts such as noise and dust may be more significant depending on how much excavation is required to construct the ladder and new access road. Operation of the fish ladder will require some amount of water to be released from the reservoir and possibly provided by supplemental sources to provide flows sufficient to encourage migration of adults and simply to fill the fish ladder, thus allowing fish passage. This may result in a small increase in downstream flows when the ladder is operational.

For the purposes of the impact analysis, it is assumed that up to 30 acres of non-developed land cover types may be permanently impacted, as well as up to 50 feet of stream lost where collection facilities at the base of the fish ladder are placed in the stream. Up to 5 acres of temporary construction impacts may also

occur on non-developed land cover types, and up to 30 feet of temporary stream impacts.

### **Gravel Enhancement Program**

Gravel traps will be constructed below the high-waterline of the reservoir. Because reservoirs provide little or no habitat for the covered species, this is not considered an impact. Some minor permanent effects to surrounding terrestrial land cover may result from the construction of new access roads between the perimeter road of the reservoir and the reservoir itself. Temporary impacts associated with gravel extraction will be minimized because excavation will occur in the summer when the stream is dry and the reservoir level has dropped below the location of the gravel trap (i.e., the gravel trap will be dry). Existing access roads will be utilized to transport gravel excavated from these traps. Placement of excavated and processed gravel in downstream reaches could increase turbidity. To minimize the severity and extent of increased turbidity, gravel will be cleaned prior to being deposited downstream of reservoirs. Gravel placement will avoid the California red-legged frog and foothill yellow-legged frog breeding seasons, if possible.

If the new gravel augmentation service yard is constructed on an already developed site, no new permanent impacts are anticipated. If the new service yard is constructed on disturbed lands (i.e., urban development land cover types that provide some habitat value to Plan species), construction will result in a conversion of these land cover types to a fully developed land cover type (e.g., urban-suburban or developed agriculture). Temporary construction impacts will be similar to those described above for development regardless of the land cover type on which the project is constructed.

### **In-stream Habitat Enhancement**

Cover enhancement includes localized installation of in-stream cover elements such as boulders, large woody debris, or biotechnical treatments along stream banks. These activities may create temporary disturbance to stream bank, bed, and adjacent riparian habitat. Short reaches of channel may require dewatering that includes bypassed flow around the construction site. If exotic vegetation removal is conducted, there may be a temporary loss of some canopy or stream-side understory vegetation function until newly planted vegetation matures. Temporary impacts are expected to be similar in scale to the temporary impacts incurred with maintenance of the water supply facilities in channels below reservoirs, but are not expected to recur at a given site (i.e., once a site is enhanced, it will not likely be targeted for enhancement again in the future).

### **Fish Passage Enhancement**

In-stream impediments to fish passage may be modified or removed to improve habitat connectivity. Impacts may occur as the result of construction activities required to improve passage (e.g., removal of a culvert or reconfiguration of an in-channel weir). If sites support flow during construction, avoidance and minimization measures described in Chapter 6 will be implemented to protect water quality downstream of the site. Depending on the projects, some ongoing

maintenance similar to that of the water supply facilities in the channels below the reservoirs may be required.

## Dam Seismic Safety Retrofit

Four of the major dams operated by SCVWD in the study area (**Figure 2-6**), two County Park dams, and one City of San José dam may need to be retrofitted in accordance with DSOD and FERC regulations for dam safety and design change. Several direct impacts would result from dam reconstruction, many of which are similar to the direct impacts described above for other in-stream capital improvement projects.

Direct temporary impacts related to dam reconstruction are anticipated to be minimal due to implementation of avoidance and minimization measures and mitigation measures. However, some temporary impacts are expected during staging of construction equipment and with the installation of a flow bypass during construction. In addition, there is also the potential for direct impacts (including noise, dust, and light [if construction activity continues at night]) on tricolored blackbirds, burrowing owls, California red-legged frogs, foothill yellow-legged frogs, California tiger salamanders, and western pond turtles. Implementation of Condition 15 *Western Burrowing Owl* and Condition 17 *Tricolored Blackbird* would help alleviate some of these impacts.

Dam reconstruction projects will be conducted to respond to existing and future safety requirements as required by DSOD and FERC, not to a need to increase reservoir capacity for expanded water supply.

## SCVWD Dams

### Borrow Sites

As described in Chapter 2, potential borrow sites<sup>3</sup> for dam reconstruction includes the following options.

- The upstream delta of the reservoir.
- The reservoir basin.
- Existing quarries.
- New quarries (a) in the reservoir basin, (b) in the canyon below the dam, or (c) in the alluvial plains within the Habitat Plan permit area.

Alluvial borrow extraction will be focused on areas where alluvial materials may be obtained without impacting wetlands, stream channels, existing or proposed Habitat Plan reserves, and the habitats of Bay checkerspot butterfly, California

<sup>3</sup> These are potential borrow sites located within the permit area of the Habitat Plan. Take associated with borrow sites located in the portion of the Three Creeks HCP permit area that does not overlap with the permit area of the Habitat Plan are possible but are not covered activities under the Habitat Plan and would require authorization through the Three Creeks HCP or another regulatory mechanism.

tiger salamander, or California red-legged frog. This has placed emphasis on obtaining borrow from agricultural and other disturbed or barren habitats, from existing quarries, and from the reservoir area below the maximum reservoir pool elevation. Rockfill excavation at Anderson Dam is assumed to be within the reservoir pool areas below the high water line and would be extracted once the reservoir is dewatered for the retrofit.

In all cases, the analysis has assumed that earthfill borrow sites will be excavated to a maximum depth of 40 feet, resulting in permanent loss of all habitat. Borrow sites may be converted to recharge areas or may fill naturally if groundwater levels are high. Alluvial areas affected would primarily be agricultural (Anderson, Calero, and Almaden) but some natural habitats will be affected. Species effects for alluvial sites tend to be low, reflecting the disturbed nature of the habitats below the dams. The functional value of agricultural lands most likely to be used for alluvial borrow at Anderson, Calero, and Almaden dams is primarily movement and foraging. Species impacts associated with the other types of land cover are likely to be greater, and the potential for impacts to covered plants increases proportionally.

Direct impacts include permanent loss of land cover, potential loss of individuals of covered species during construction and material hauling, and fragmentation of habitat at the landscape level. Noise, dust, and light related effects, previously described for nighttime retrofit activities, are likely to occur as a result of night time borrow extraction. Implementation of avoidance and minimization measures described in Chapter 6 are expected to reduce potential indirect impacts.

### Dewatering Events

Dam seismic safety retrofit will likely require reservoir draining, construction in the dry reservoir, and reservoir refilling to the point at which the reservoir is re-operated according to applicable rule curves (collectively referred to as a dewatering event). The impacts associated with each of these actions are described below.

**Table 2-4** shows the maximum covered release flows resulting from reservoir draining during a dewatering event<sup>4</sup>. Due to the unique characteristics at each dam site, a reservoir-specific dewatering plan will be developed and submitted to the Wildlife Agencies for review and approval prior to the first dewatering event for each reservoir (see Chapter 8, Section 8.7.3, subheading *Additional Review* for details of this process). This dewatering plan will specify the timing, frequency, and duration of reservoir releases associated with dewatering events. Since the level of detail is not known at this time, the maximum covered reservoir release flows shown in **Table 2-4** are provided as anticipated worst-case scenario for impact evaluation based on the professional judgment of the SCVWD. If at the time a dewatering plan is developed SCVWD determines the flow releases will be higher than those in **Table 2-4**, additional consultation with

<sup>4</sup> Pulse flows implemented for the benefit of anadromous fish species (see Section 2.3.4) may be greater than the flows anticipated for draining of a reservoir as part of a dewatering event. These higher flows are also covered by this Plan.

the Wildlife Agencies will required and additional mitigation may also be required.

Although up to 18 dewatering events are covered under this Plan, SCVWD will only undertake a dewatering event if absolutely required to maintain dam safety. In addition, the dewatering plan will identify avoidance and minimization measures that will reduce the potential effects of draining a reservoir. A key avoidance and minimization measure that SCVWD anticipates including in most, if not all, dewatering plans is a ramping schedule for flows. Ramping flow releases (i.e., slowly building up to a maximum release flow over a specified amount of time) when beginning reservoir draining will help avoid washing covered species downstream. Ramping down flows at the end of draining will help avoid drying back the channel faster than covered amphibian and reptile species can move to new locations to avoid stranding.

After accounting for avoidance and minimization of draining impacts, draining the reservoir may have residual adverse impacts to covered species. Reservoir dewatering will initially result in higher reservoir releases affecting the stream downstream of the reservoir. Extended periods of high flow will affect a significant portion of the channel downstream from the affected reservoir. Increases in flow may affect California red-legged frog egg masses or juveniles if flows are released in early spring before these species have had the opportunity to move out of streams. Foothill yellow-legged frogs may also be affected by high flows; however, this species is more likely to be found in the upper watershed (above dams). Consistent high flows, if started early enough in the year and continued through late spring, may facilitate breeding by providing a reliable water source and may also reduce the potential for stranding. High flows are not expected to affect western pond turtle breeding as this species tends to lay its eggs in uplands away from the active channel.

The Implementing Entity will monitor the effects of flow regulation (including dewatering events) on California red-legged frog, western pond turtle, and foothill yellow-legged frog populations that occur in streams hydrologically affected by existing dams in the permit area (Chapter 7, Section 7.3.3 *Species-Level Actions*). This monitoring data will inform the adaptive management process and help to minimize effects on these downstream populations. Results will be reported to the Wildlife Agencies within 60 days of the conclusion of each dry season and wet season dewatering event. Based on these results, the Wildlife Agencies may require an adjustment in the maximum reservoir release flows in **Table 2-4**. During reservoir drawdown, exotic fish and other aquatic species contained in the reservoir may enter the downstream channel in large numbers, resulting in increased predation on aquatic covered species. While these exotic species already exist below the dams, increased numbers of exotic species may increase the level of predation. Potential impacts associated with exotic species will be reduced with implementation of avoidance and minimization measures for dewatering described in Chapter 6 that may be incorporated into the dewatering plan.

Once the reservoir is drained, releases from the reservoir will be limited to bypassed inflow collected at an upstream location and flow from groundwater

seepage. Bypassed flows would be released into the stream immediately below the footprint of the project; therefore, no complete drying out of the channel immediately below the project footprint is expected. There may be some local runoff from tributary watersheds and from domestic irrigation, and in some locations the channel may be fed by upwelling of groundwater, but in all but the wettest years, perennial flow is not common. It is expected that, without supplemental water sources, much of the channel below the dewatered reservoir will go dry and remaining wetted portions would be of poor habitat quality. A supplemental flow system may be installed as part of the proposed Three Creeks HCP Conservation Program at Anderson and Calero Main dams. For reservoirs where supplemental flows are not provided, this impact could potentially affect the area in the channel from the base of the dam to the first confluence with another stream that is fed by a different reservoir. Watershed level impacts will be avoided through measures described in Chapter 6 that only allow one reservoir per watershed to be dewatered at one time.

Loss of water in channels downstream of dams is likely to affect amphibians and reptiles covered by this Plan, and may also affect riparian vegetation along creeks below dams. For the past 10–15 years, dry-back of channels below reservoirs has been minimized to avoid species impacts. Some seasonal dry-back has occurred on Uvas and Llagas creeks, but has been almost entirely avoided on Coyote Creek and Guadalupe River with the exception of approximately 600 feet on Guadalupe Creek in the summer of 2007 due to drought conditions. Thus, covered amphibians and reptiles are not accustomed to seasonal fluctuations in flows, particularly in the northern watersheds of the study area. Some stream segments in the study area below reservoirs currently dry out on an annual basis and reduced flows during a dewatering event may be similar to natural drought conditions. During such times, it is likely that adults of these species will move away from dry streams in search of water in nearby areas. Because dewatering events are generally only expected to last one season, riparian vegetation is not likely to be substantially altered during dewatering. Impacts may be more severe during an extended dewatering event (up to 3.5 years for seismic safety retrofit at Anderson Dam and 2.5 years for all other dams) if occurring during a drought. Immediately below dams, vegetation will still benefit from the natural drainage of the watershed which will be bypassed around the dam. Further downstream, runoff from urban areas is often considerable and enough to keep flow in the channel throughout the year.

Maintaining the reservoir free of water during construction will eliminate the majority of aquatic habitat upstream of the dams around the reservoir perimeter for aquatic covered species, including western pond turtles. Covered species using this area would be required to seek other habitats, which will be limited and which will affect their ability to re-establish following dewatering and repair of the reservoir facilities. Under the worst-case scenario, inflow may be non-existent for several months of the construction period, probably the months of July, August, and September when evapotranspiration is highest and ambient air and water temperatures are also high.



Construction activities occurring in the reservoir during dewatering will implement avoidance and minimization measures as described in Chapter 6, Condition 4 *Stream Avoidance and Minimization for In-Stream Projects*.

During refilling of the reservoir, outflow may also be constrained. First, the reservoir will not make releases until the reservoir has reached the level of the lowest outlet gate. Second, early in the refilling, water quality requirements may limit releases to maintain suitable quality of bypassed flows. Third, SCVWD will endeavor to re-fill the reservoir for both water supply and sustained-flow considerations. Winter flows may be constrained, affecting the length of transition time back to sufficient storage for intended operability. In a dry period, a drained reservoir may not be re-operated according to applicable rule curves until up to 2.5 years from the time reservoir draining is initiated. A dewatering event that takes longer than 2.5 years, with the exception that Anderson Reservoir is covered up to 3.5 years for a dewatering event associated with a seismic safety retrofit, is not a covered activity and SCVWD would initiate consultation with the Wildlife Agencies.

Covered species are unlikely to move into dewatered reservoirs as these sites will, in general, be continuously disturbed until refilling starts. If a project-specific situation arises where impacts to covered species could occur, the potential impact would be identified in the dewatering plan and species surveys as described in Chapter 6 would be required.

## County Parks Dams

As discussed in Chapter 2, County Parks dams are much smaller than SCVWD dams, thus, while many of the construction impacts will be the same as those described for SCVWD dams, the scale is much smaller.

Sandywool Lake is located along a small tributary (less than 0.75 miles) to Arroyo de los Coches. Engineered channels allow natural flow from above Sandywool Lake to bypass the lake and continue in the tributary to its confluence with Arroyo de los Coches. Sandywool Lake is used for irrigation and is not managed for water supply to the tributary, thus, the channel below the lake is typically only supplied with natural flows. Dewatering the lake is not expected to affect this tributary or local riparian vegetation.

Grant Lake is not located on a stream, but it does have a drainage connection to Arroyo Aguaque Creek, a tributary to Upper Penitencia Creek. Dewatering Grant Lake is not expected to affect the water supply for local streams.

Borrow sites will be sited in the California annual grassland land cover type or in other already disturbed areas. Whenever possible, borrow sites will be used to create habitat for covered species (e.g., a pond for California tiger salamander). In these cases, development of borrow sites will result in the conversion of one land cover type (e.g., grassland) to another land cover type (e.g., pond). Areas around the borrow site may be temporarily disturbed during borrow site

construction. Location of borrow sites will be within County parks, but exact locations are unknown at this time.

## **City of San José Dams**

As discussed in Chapter 2, Cherry Flat Dam is much smaller than SCVWD dams, thus, while many of the construction impacts will be the same as those described for SCVWD dams, the scale is much smaller.

Cherry Flat Reservoir is located on Upper Penitencia Creek, almost at the top of the catchment; the watershed above the reservoir is 2.4 acres. This reservoir is not currently managed to support fish flows in Penitencia Creek, although it is managed to maintain minimal flows through Alum Rock Park (approximately 0.5 cubic feet per second [cfs]) during summer months. SCVWD has a release point from a pipeline that provides most of the flow in this channel based on SCVWD operational needs, including flows to support fish. Dewatering the lake may reduce the 0.5 cfs summer flows.

The borrow site for this project will avoid sites in areas designated as high or medium priority for conservation in this Plan. Areas around the borrow site may be temporarily disturbed during borrow excavation. Borrow sites will be subject to Wildlife Agency review and approval during implementation of the Plan (Section 8.7.3 *Wildlife Agency Responsibilities*).

## **Dam Instrumentation Project**

As described in Chapter 2, the Dam Instrumentation Project includes the installation of piezometers, inclinometers, survey monuments, real-time monitoring systems, seepage collection systems, reservoir level gauges, and seismographs related to the maintenance of dams in the permit area. Implementation of these activities will result in permanent and temporary impacts associated with installation of equipment and subsequent maintenance. All activities associated with the Dam Instrumentation Project will occur within the same areas as will be affected under the Dam Maintenance Program (described below).

## **In-Channel Groundwater Recharge Facilities**

SCVWD plans to re-operate the Ford Road Groundwater Recharge Pond and the Church Avenue Groundwater Recharge Pond. Both ponds were previously constructed but the Ford Road facility has been out of use and the Church Avenue facility has been operated at reduced capacity. The Ford Road reoperation includes expansion of the site to include up to three additional new ponds. This action would result in the conversion of existing land cover types to the pond land cover type, although these new ponds will be managed to support water supply operations and will not likely support use by covered species. As

described in Chapter 2, Ford Road Pond will be supplied by flows from a new pipeline that receives flows from a new diversion upstream of Ford Road Ponds at Metcalf Road. This new diversion will also provide flows to the Coyote Percolation Pond after it is separated from the main channel as part of the proposed Three Creeks HCP Conservation Program. Church Avenue Pond is supplied by an in-channel diversion which may require rehabilitation.

New construction or rehabilitation of in-channel diversions will affect the stream bank and riparian vegetation surrounding the diversion structure. The new structure will permanently impact riparian land cover types while the rehabilitated structure will be temporarily disturb riparian land cover types where the diversion is rehabilitated. The footprint of the diversion is not expected to change in size, thus impacts to riparian vegetation at the diversion are expected to be temporary during construction. Additional permanent impacts resulting from re-operation of the ponds includes conversion of the dried out pond bed (currently characterized by golf course/urban parks and grain/row-crop/hay/pasture land cover types) to pond land cover type.

Re-operation of the Ford Road and Church Avenue groundwater recharge ponds is not expected to affect in-channel flows. Ford Road pond is being re-operated and expanded in anticipation of reduced in-channel recharge that is expected to occur when the currently on-channel Coyote and Ogier percolation ponds are separated from Coyote Creek. Construction and operation of Ford Road ponds will allow SCVWD to maintain the same level of water diversion to the groundwater basin. As described in *In-Stream Operations and Maintenance* subheading *Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds* (National Marine Fisheries Service et al. 2009), Church Avenue ponds will divert flows from Llagas Creek when reservoir capacity allows, consistent with anadromous fish flow and on-channel recharge requirements. If, when these projects are ready to be implemented, SCVWD identifies a potential change in downstream flows due to re-operation that may adversely affect covered species, additional consultation with the Wildlife Agencies will required.

## **New Bridge Construction and Replacement/Rehabilitation**

It is estimated that all existing bridges in the permit area will need to be replaced approximately once within the Plan's permit term. Rebuilding all existing bridges, as well as constructing new bridges, will result in impacts on natural communities and covered species. New and rehabilitated bridges will be designed to federal and state guidelines at the time of construction. Conditions on covered activities described in Chapter 6 encourage the use of free-span bridges; however, wide crossings on major roads will likely require construction of pilings in creek beds. Installation of pilings, piers, and/or footings may contribute to roughness in the stream and slow flows in the vicinity of the pilings. Sediments and vegetation may become trapped on the upstream side of the piling, potentially causing further disruptions to flow. Also, scour may occur

immediately downstream of pilings and contribute to channel erosion and downstream sedimentation. In such cases, conditions described in Chapter 6 will be applied to assess the potential effects of a specific bridge design and to implement design elements that will reduce potential negative effects. Reconstruction projects may entail expansion of the existing footprint up to twice as wide as the existing footprint to account for increased traffic demand or new safety requirements such as pedestrian and bicycle access and wide shoulders for emergency access. Such expansion will result in permanent and temporary impacts on terrestrial and aquatic land cover types.

The amount of habitat loss will depend on whether the project is new construction or rehabilitation of an existing structure. Use of standard construction mitigation measures (e.g., proper management of dewatering activities) and avoidance and minimization measures will help to reduce or prevent temporary impacts on water quality during construction.

The County of Santa Clara Roads and Airports Department anticipates one of its road connection projects will require a new bridge across Llagas Creek. A new bridge across Gavilan Creek will also be required for a VTA road extension project. Approximately 75% of new bridges will be related to private development and will be intended for access use by residents in those areas. New bridges constructed in County parks or for access to parts of the Reserve System will be carefully managed for proper use on newly accessible lands. Construction of new bridges outside the planning limits of urban growth may result in indirect impacts associated with increased access to areas that are currently less accessible, including reserve lands that support natural land cover types and/or covered species. As described above in Section 4.3.1 *Urban Development* increased use of open space that is facilitated by new creek crossings may result in impacts on land cover and covered species related to introduction of nonnative species, general use, and illegal activities such as trash dumping. However, indirect impacts related to bridge reconstruction are anticipated to be minimal. Reconstructed bridges are not anticipated to encourage additional traffic beyond that expected on the basis of existing and planned land use patterns.

## Streamside Trails and Crossings

As discussed in Chapter 2 and above under *Flood Protection Capital Projects*, SCVWD plans to develop stream-side trails along existing maintenance roads and along new maintenance roads installed as part of flood protection projects. In addition, County Parks and the cities also plan to develop new trail projects, some of which will occur in in-stream areas. Direct impacts from establishing trails along existing maintenance or access roads would have minimal, if any, new direct impacts to land cover as the trail would be placed along an existing road. New trails outside of existing roads or trails would have new impacts to vegetation removed for project construction. Impacts may also occur where new signage is installed. However, whenever possible, signage will be installed in disturbed areas.

Indirect impacts related to development of trails are largely related to ongoing use of trails. Expanding access to stream side areas exposes the stream and riparian areas to higher levels of use which may result in increased pollutants in the stream such as trash, trampling of vegetation, and vandalism. Most of the stream side trails developed in the permit area will be along streams maintained by SCVWD for flood control purposes. The majority of these maintained streams are located in urban or suburban valley floor areas. Trails in the Reserve System and outside of urban or suburban areas will be sited outside of the riparian corridor thus reducing the opportunity for these types of indirect impacts to streams (see Chapter 6, Section 6.4.2, subheading *Condition 4 Stream Avoidance and Minimization for In-Stream Projects* and **Table 6-3**).

### 4.3.3 In-Stream Operations and Maintenance

Many operations and maintenance activities in streams may have direct and indirect impacts on natural land cover types and covered species. A discussion of the operations and maintenance activities that may cause impacts is provided below.

#### Facility and Stream Maintenance

Direct impacts of in-stream operations and maintenance activities may result from maintenance of facilities such as bridges, culverts, dams, trails, and roads in the riparian zone. Impacts may also occur during maintenance of streams used for flood control and associated infrastructure such as access roads. Stream maintenance activities may include sediment removal, bank stabilization, levee maintenance, access road maintenance, and vegetation clearing, including fire break maintenance and rodent control, if such action becomes necessary (rodent control measures will be minimized under the Plan).

County Parks and the Cities of Gilroy and Morgan Hill also conduct some in-stream maintenance on their properties. In-stream operations and maintenance activities conducted by cities focus mostly on maintenance of trails and overhanging riparian vegetation. In-stream maintenance activities conducted by County Parks are similar to activities conducted by SCVWD under the Stream Maintenance Program, but with reduced frequency and on a smaller scale. County Parks attempts to replace culverts with in-kind materials and in the same footprint as the existing culvert. However, new and reconstructed culverts are required to be in compliance with conditions in Chapter 6 which may require some design modifications. These Local Partners may also conduct small-scale bank stabilization and sediment removal projects.

Direct impacts associated with in-stream operations and maintenance occur while accessing project sites (e.g., natural land cover is removed to reach a gage or bank stabilization site) or as a result of implementing an operations and maintenance project (e.g., sediment removal). Additionally, maintenance of facilities such as repair and installation of fencing or a monitoring gage may

require vegetation removal in order to access the project site; such vegetation removal would constitute temporary impacts on natural land cover types in the immediate vicinity.

Maintenance of in-stream infrastructure, including trails in riparian areas and bridges, has the potential to result in direct temporary and permanent impacts. However, all project proponents are required to implement the conditions on covered activities described in Chapter 6, including implementation of avoidance and minimization measures.

Direct temporary impacts associated with facility maintenance potentially include increased noise or dust during activities utilizing heavy equipment for mowing or resurfacing roads. Staging areas will be temporarily disturbed by workers and construction equipment. In such cases, application of avoidance and minimization measures would reduce these impacts.

## **Sediment Removal and Mercury Remediation**

As described in Chapter 2, minor mercury remediation projects may be undertaken by Local Partners incidental to sediment removal projects. Sediment removal in stream reaches downstream of abandoned mercury mining operations has the potential to release mercury into the water column and to allow mercury to move downstream of project sites if work is conducted in an active channel. In local streams, mercury may be converted by bacteria into methylmercury, which is highly toxic. Methylmercury may be taken up by insects and other invertebrates which, in turn are consumed by fish and other organisms up the food chain. Over time, methylmercury may bioaccumulate in fish and may cause reduced fertility, impaired growth and development, and abnormal behavior. However, conditions on covered activities require dewatering prior to commencement of work that may contain mercury in the sediment. No indirect effects of sediment disposal are anticipated, because removed sediments are tested for mercury and, if required, are disposed of in a proper receiving facility.

## **Reservoir Operations under DSOD Interim Storage Restrictions**

Reservoir operation under DSOD interim storage restrictions could affect the implementation of the proposed Three Creeks HCP Conservation Program target flows or future operating rules for Uvas and Llagas watersheds, particularly efforts to modify reservoir release schedules to address flow and temperature issues. Over the last 12 years of DSOD storage restrictions, SCVWD has been generally successful in avoiding dry-back of channels. As noted above under *Dewatering Events*, for the past 10–15 years, dry-back of channels has been limited to some seasonal dry-back on Uvas and Llagas creeks, but has been almost entirely avoided on Coyote Creek and Guadalupe River.

However, increased storage restrictions would further reduce reservoir storage. Lower reservoir storage requires that summer flow regimes will be lower than under the proposed Conservation Program and dry back of the affected channels will occur earlier. This may result in stranding of California red-legged frog or foothill yellow-legged for embryos and tadpoles during dry back. During summer, SCVWD does not have water rights to detain natural flows in the reservoir. These flows are by-passed around the reservoir to help maintain a wetted channel, even though it may not reach the requirements of Conservation Program flows. During wet years, by-passed flows are greater and alternative flows from tributaries or groundwater upwelling also help to maintain a wetted channel below dams.

In addition to natural flows (from by-pass or groundwater upwelling), SCVWD anticipates installing supplemental water supply systems at the base of Anderson and Calero Main dams as part of the Conservation Program. Once functional, these systems can be used to meet Conservation Program flow targets (and therefore a wetted channel) during implementation of DSOD interim storage restrictions.

As described above, the Implementing Entity will monitor the effects of flow regulation on California red-legged frog, western pond turtle, and foothill yellow-legged frog populations that occur in streams hydrologically affected by existing dams in the permit area and report to the Wildlife Agencies.

SCVWD expects that it will be able to meet most conservation flows described for the proposed Three Creeks HCP Conservation Program under DSOD restrictions at all times, with perhaps the exception of during a drought. Stream reaches that are dry for more than one year as a result of DSOD storage restrictions will be considered permanently impacted for the purposes of this Plan. Because SCVWD does not anticipate this situation occurring, the impacts of an extended dewatering were not considered in the stream impact caps set for this Plan (**Table 4-2**). If streams are dry for more than one year as a result of DSOD storage restrictions, SCVWD will begin a separate consultation process with USFWS and CDFG and may be required to provide additional mitigation beyond that required by the Habitat Plan. These effects will be minimized through conditions described in Chapter 6 and mitigated through payment of fees (see Chapter 9, *Costs and Funding*) and the Conservation Strategy (Chapter 5).

## Reservoir and Recharge Pond Operations

Effects of reservoir and recharge pond operations are discussed together because operations are conducted in tandem, thus effects of one are also the effects of the other. SCVWD operates eight dams and several in-channel and off-channel groundwater recharge ponds within the permit area to support the water supply needs of Santa Clara County. Operation includes flow management, diversion, delivery, and storage. Operation of these facilities focuses largely on timing reservoir releases to supply water to treatment plants and recharge basins. Several covered species may utilize habitat in streams downstream of SCVWD dams. Species models (**Appendix D**) indicate that California tiger salamander is

known to occur downstream of Anderson and Uvas dams in or near to Coyote Creek and Uvas-Carnadero Creek, respectively. California red-legged frog is known downstream of Anderson and Coyote dams on Coyote Creek, and Uvas dam on Uvas-Carnadero Creek. Foothill yellow-legged frog is known to occur on or near to Uvas-Carnadero Creek downstream of Uvas dam. Finally, western pond turtle is known to occur below Anderson and Almaden dams. All of these occurrences are in the near east and west foothills of the study area, and none of these species are known to occur along streams in heavily urbanized areas with the exception of California tiger salamander which has three occurrences on Communications Hill in San José and one occurrence along Coyote Creek in urban San José.

Direct and indirect impacts may occur through several mechanisms including changes in hydrology and sediment transport, lifecycle disruptions, and introduction of exotic species. In addition, impacts may be exacerbated if DSOD interim storage restrictions are increased to the maximum amount covered under this Plan (see Chapter 2, **Table 2-5**). Each of these impact mechanisms is described below.

## Flow

The purpose of reservoirs and recharge basins is to store water for improved management of long-term water supply needs. The capture and storage of flows results in changes to the natural hydrology of the watershed in. Reservoir and associated recharge operations generally alter local hydrology by reducing stream flow during the wet season when flows would be higher under natural conditions and by increasing stream flow during the dry season when flows would be lower under natural conditions. Flows are reduced during the wet season as reservoirs and recharge basins both capture available water, particularly early in the season. During the dry season when channels would normally have very low flows, flows are above normal as SCVWD releases water from its reservoirs to maintain water in recharge basins and to meet water supply needs. As such, the channel below dams remains wet for more of the year than may be expected under natural conditions. This regulation of flows may be beneficial to covered frog species that utilize habitat below dams due to a more reliable breeding habitat. However, consistent with natural drought conditions, during or immediately following dry years, the volume of flows released may be altered so that target storage levels in reservoirs and recharge basins may be restored. Large release delays, the reduction in release magnitude, and recharge diversions may reduce habitat due to inadequate flows.

During operation as described above, there may be times of rapid increases or decreases in flows; however, SCVWD does generally ramp flows to reduce potential impacts. This may occur due to unplanned maintenance needs (e.g., blow-off of a pipeline, dewatering of a recharge pond, filling a recharge pond). Rapid decreases in flow may result in stranding of eggs and larvae of California red-legged frog. The potential for increased flows are greatest November through April when eggs and tadpoles are most vulnerable to changes in habitat. The potential for decreased flows may occur at any time of the year. Adults may



also be affected, but have more mobility to combat such environmental changes. However, individuals forced to move out of cover in search of new cover may temporarily be exposed to a higher risk of predation. Foothill yellow-legged frogs are thought to be extirpated below major dams in the study area and would therefore not likely be affected by changes in flows due to dam operations.

Flows are also altered by the operation of diversions and in-channel recharge areas. Through the use of inflatable and flashboard dams, in-channel areas are periodically ponded so that flows can be diverted to off-channel recharge areas or infiltrated into the groundwater basin. Ponding has a number of related impacts including the following.

- Emergent and submergent vegetation is flooded, may be covered by fine sediments, and may die off affecting availability of vegetation appropriate for attaching covered species egg masses.
- Cover is reduced for all covered aquatic species.
- At times when the pond would be drained, backwater pockets within the pond basin may create stranding conditions for frogs—adults or larvae.
- All covered amphibians and reptiles may be affected by higher rates of predation due to low velocity flows and lack of cover.
- The diversion ponds support populations of nonnative fish and amphibians which may prey on native amphibians and turtles.

Condition 5, *Avoidance and Minimization Measures for In-Stream Operations and Maintenance*, described in Chapter 6, will minimize these effects.

## Sediment Transport

Reservoirs capture sediment and debris that would otherwise reach the channel below the dams. In particular, reservoirs capture sands and gravels. In addition, large woody debris such as trees and large rock accumulate behind the dam and do not reach the downstream channel. At the same time, a portion of the very fine sediment entering the reservoir remains in suspension and passes through the reservoir into the downstream channels. The result is a combination of altered hydrology and altered sediment transport which affects downstream habitat quality.

The combination of gravel embeddedness and flow changes in the channels below the dams also affects food production and transport. Fine sediment embeddedness inhibits the development of the benthic macroinvertebrates. In addition fine sediments accumulate in low velocity runs and long pools and reduce the general productivity of the aquatic system. Low food production and transport associated with gravel embeddedness and fine sediment accumulations may affect amphibian eggs and juvenile California red-legged frogs, foothill yellow-legged frogs, and western pond turtles (although the presence of exotic species in the affected reaches of channel may preclude viable populations of these covered species in the areas affected).

Increased fine sediments may also cover and thus affect egg laying substrate for amphibians including California red-legged frog. Increases in fine sediment may also affect turbidity (discussed below).

In-channel percolations ponds trap fine sediments during the dry season. Large winter storm events, or the removal of in-channel diversion dams to allow salmonid passage, wash the fine sediments from the in-channel ponds and increase turbidity downstream. Depending on timing, this release of sediment may partially cover egg masses of covered amphibians along the margins of the channels.

## Water Quality

Water quality is affected by reservoir releases and recharge pond and pipeline releases. The operation of these systems can result in changes to turbidity, dissolved oxygen, creation of methyl mercury. Operations also affect sediment transport, but this is discussed in the preceding paragraphs.

Reservoirs have a substantial impact on turbidity, both through changes to sediment transport (discussed above) and algal production. Both reservoirs and in-channel ponds behind diversion dams create heat and nutrient sinks. This combination leads to substantial algal production. High levels of algae result in high turbidity as well as fluctuations in dissolved oxygen. Increased turbidity may inhibit foraging of covered amphibians.

Other causes of increased turbidity include overflow and scheduled releases to channels from reservoirs, recharge ponds, and pipelines. These releases may increase turbidity at and downstream of the release points. These releases may coincide with or be independent of storm events. Scheduled releases from ponds or pipelines do not generally cause extensive turbidity increase except during the first release after an extended period of time during which sediments built up in a pipeline or pond. Suspended sediments from such releases would be anticipated to settle out of the water column within 300–1,000 feet, depending on flow rate.

High levels of algae may also affect dissolved oxygen levels. Given the right conditions, nightly dissolved oxygen levels can drop to levels stressful to covered amphibians. This may be observed during larval and tadpole stages; however, covered amphibians will most likely be able to breathe air by the summer when the effect is most apparent. This is most likely to affect areas of slow-moving pools and runs in downstream reaches and in the in-channel diversion ponds.

Dissolved oxygen levels may also be affected by other aspects of reservoir operation. During normal reservoir operations, water may be released from the cold water pool (hypolimnion) with very low dissolved oxygen levels. These releases affect a short reach downstream, as the flow rapidly aerates as it moves downstream. SCVWD studies indicate that this effect may extend about 100–300 yards downstream of the release point. This reduces the suitability of this reach for all aquatic species. Some dams have facilities for ensuring oxygenation of release water.

Metallic mercury enters reservoirs in runoff from local soils containing mercury and from airborne pollution. Once in the reservoir, mercury sinks to the bottom and, when the reservoir stratifies and produces anoxic conditions, microbes convert the metallic mercury to methyl mercury, which is toxic to fish, wildlife, and humans. Releases from the hypolimnion release methyl mercury which may be taken up by plants and animals downstream, thus accumulating in the food chain. This has the potential to affect covered amphibians.

## **Covered Species Movement**

In-channel structures (dams, diversion facilities, drop structures, and stream gauge weirs) create barriers to upstream and downstream movement of covered amphibians and reptiles. Movement of amphibians may be particularly impeded during low-flow periods. Movement constraints inhibit species ability to disperse and expand ranges. In-channel ponds behind diversion dams also present barriers to movement because these areas are often populated by exotic species that prey on covered species. The effect may be less pronounced at smaller structures that do not preclude adult individuals from utilizing the riparian zone to move through a reach.

## **Exotic Species**

Water supply operations that bring non-local water into the study area (i.e., imported water supplies) introduce and distribute exotic (nonnative) species on an on-going basis, alter habitats in a manner that increases exotic species' competitive advantages over native species, and allows exotic species to prey on native species. Off-channel recharge ponds that are accessible to the general public, through legal or illegal access, also provide a mechanism to introduce exotic species (e.g., through the dumping of pets like bullfrogs). Informal monitoring of percolation ponds by SCVWD has shown that these ponds typically do support large populations of exotic species and very infrequent use by covered species (D. Arnold pers. comm. c). Any new individuals added to these ponds by the general public would contribute to a reservoir population of invasive species and could result in the spread of some invasive species (e.g., bullfrogs, nonnative turtles, and fish) into more natural habitat of covered species breeding ponds within dispersal distance. Conditions described in Chapter 6 that require exotic species to be dispatched when ponds are drained for maintenance purposes could help to reduce local populations of exotic species.

In-channel recharge ponds provide habitat for exotic species such as bullfrogs and bass, which both compete with and prey on California red-legged frogs, foothill yellow-legged frog, and western pond turtles. This reduces the successful occupation of the inundated reaches by covered species using local streams to support various life stages and may also act as a reservoir population that spreads into less affected stream reaches.

## Proposed Operating Rules for Reservoirs

New operating rules for the reservoirs in the northern portion of the permit area may be implemented as part of the proposed Three Creek HCP. New operating rules for Uvas and Chesbro reservoirs may be established through an informal consultation with NMFS and CDFG, a new HCP process, or through formal consultation with NMFS pursuant to Section 7 of the ESA. Implementation of new operating rules for reservoirs are anticipated to include modifications of reservoir releases that would change the area of wetted channel. The focus of these operating rules is to provide enhanced flow conditions and manage cold water habitat for listed fish species. However, changes to releases may also affect species covered under this Plan including California red-legged frog, foothill yellow-legged frog (if it occurs below reservoirs), and western pond turtle. Anticipated changes in operations will reduce early dry-season release rates and increase late dry-season release rates. The effect will be to dry back the downstream reach of the wetted channel earlier than would occur under baseline operations conditions.

In the process, some foothill yellow-legged frogs and California red-legged frogs may become stranded below the zone of sustained flow. This is an early dry-back impact; the channels in question would often be expected to dry back under baseline conditions, because of the high percolation rates in the recharge zone. Any effects are therefore related to the early action to reduce flows. Dry-back may occur before juvenile California red-legged frogs have the ability to leave the channel. In dry years, when the sustainable flow is low, ponded habitat to support frog tadpoles would generally not be available.

As described above, the Implementing Entity will monitor the effects of flow regulation on California red-legged frogs, western pond turtles, and yellow-legged frog populations that occur in streams hydrologically affected by existing dams in the permit area and report to the Wildlife Agencies.

## Recharge Pond Maintenance

Maintenance of recharge basins will range from routine management of vegetation and debris to dewatering and sediment removal to complete reconfiguring of a recharge site on a periodic basis. Sediment removal and reconfiguration require dewatering and substantial disturbance of the pond. Vegetation may be entirely cleared from the edges of the pond and sediment scraped from the bottom of the pond, removing any submerged vegetation in the pond. This type of maintenance has been ongoing at SCVWD recharge ponds prior to implementation of the Plan. Some ponds retain vegetation around the edges during and after maintenance that may provide refugia for covered species during pond maintenance. Other ponds are maintained devoid of vegetation and are unlikely to support covered species before, during, or after maintenance. Although regular maintenance inhibits the development of quality habitat, some recharge ponds are known to support western pond turtles. Western pond turtles using these sites may be temporarily affected by loss of habitat during

maintenance activities, or may be permanently extirpated from the site in cases where suitable habitat is entirely removed. In addition, western pond turtles could be injured or killed by maintenance activities.

Maintenance of in-channel recharge ponds may compact soils in and adjacent to the channel. Depending on the site and time, this may injure or kill amphibians utilizing upland refugia and/or amphibian egg masses. These effects will vary by time of year and extent of activity.

Maintenance will require earthmoving activity and disturbance of soil. If there is precipitation during the construction period or before vegetation is fully established on the affected land, there may be construction-related runoff to the riparian/aquatic habitats at and downstream of the construction site. Runoff from the construction zone may raise suspended sediment levels and increase turbidity resulting in suspended sediments being mobilized and discharged to the channel. In addition, dust may be generated by construction which will disperse beyond the construction area. Finally, proximity of construction equipment to the stream channel may result in fuel, lubricant, and other chemical spills to leak into the channel. Application of avoidance and minimization measures identified in Chapter 6 will greatly reduce the potential for sediment runoff during construction.

## **Dam and Reservoir Maintenance**

Dams and reservoirs operated by SCVWD, County Parks, and the City of San José require routine and corrective maintenance to ensure their proper inspection, functioning, and safety. SCVWD operates 8 dams, as well as Coyote Percolation pond in the permit area. County Parks maintains six dams, one at Sandywool Lake and five at Grant Lake. The City of San José maintains Cherry Flat dam.

Dam and reservoir maintenance activities may include infrastructure maintenance including roads, repair or replacement of dam components and stream flow equipment, vegetation clearing on the dam face, and removal of rodent burrows. Direct impacts associated with activities such as road maintenance and vegetation management are similar to those identified above including permanent and temporary loss of vegetation around facilities.

The net effect of dam face maintenance is to permanently clear the face and abutments of dams of all deep rooted vegetation that could impair the integrity of the dam face or inhibit regular inspection of the dam face for leaks and seepage. While the frequency and extent of covered species use of dam faces is not well quantified, there is a potential for covered species such as California red-legged frog, California tiger salamander, and western pond turtle to use this habitat under current conditions.

## SCVWD Dam Maintenance Program

SCVWD's Dam Maintenance Program is a covered activity under both the Habitat Plan and the proposed Three Creeks HCP. The Dam Maintenance Program describes activities conducted by SCVWD to operate, maintain, and repair water supply facilities including dams, appurtenant structures, and downstream recharge facilities. These activities include the activities discussed above, but also extend to burrow management on the dam face and sediment removal from the reservoir basin.

SCVWD requires that all burrowing animals are to be removed and burrows filled. The effect of these activities is to make the habitat permanently unsuitable for covered species, including covered plant species. Routine and corrective dam maintenance requires filling of burrows to prevent seepage from causing internal dam erosion, which can lead to dam failure. Burrow management involves both efforts to reduce the populations of burrowing animals such as ground squirrels and excavation and re-compaction of any burrows that are found on the dam face and abutments. Therefore, this activity could potentially affect covered species that may be using the burrows as refugia.

Reservoirs require sediment management to maintain reservoir function (e.g., removal of sediment that blocks inlets), and to provide a source of native gravels for downstream aquatic habitat enhancement. This activity requires sediment extraction and hauling at the upstream end of the reservoir and sorting, cleaning, drying, stockpiling at the new gravel augmentation facility described in Section 2.3.3 *In-Stream Capital Projects*. Extraction and hauling require the use of heavy construction equipment.

SCVWD has identified a footprint for each of its dams in which regular dam maintenance will occur. For the purposes of the impact analysis, it is assumed that all natural land cover types will be permanently removed from dams.

Direct and indirect impacts associated with a dewatering event for maintenance purposes and for provision of supplemental water supplies are the same as those discussed in *Dam Seismic Safety Retrofit*, however, impacts may occur at a reduced scale, as full dewatering of the reservoir is not always needed for maintenance activities.

## Non-Routine Stream Maintenance

Most in-stream maintenance in the study area is performed by SCVWD and is currently covered under that agency's Stream Maintenance Program. However, as discussed in Chapter 2, some activities, such as those taking place in serpentine habitats, are considered non-routine and are excluded from the Stream Maintenance Program. Specific non-routine stream maintenance activities covered by this Plan include extensive, one-time vegetation management in the lower Llagas Creek flood control channel, repair and maintenance of canals

(including in serpentine areas), winter season work in canals, invasive vegetation management, maintenance of stream gage and rain gage facilities.

Vegetation management in lower Llagas Creek is expected to reduce overall vegetation in the channel by approximately 50% in perpetuity (once vegetation is initially removed, long-term maintenance to the 50% level will be covered by the Stream Maintenance Program permits). Invasive vegetation management is intended to result in a permanent reduction of invasive vegetation but an increase in native plant species as the site allows.

Repairs to canals including bank stabilization, sediment removal, and vegetation management not otherwise permitted by the Stream Maintenance Program (e.g., in serpentine vegetation areas and during the wet season) are covered under this Plan. Bank stabilization activities may result in both permanent and temporary impacts depending on the size of the project and approach to stabilization used. For example, if rock rip-rap or concrete is required, any natural land covers at the site would be permanently removed. If, however, the repair can be made using compacted earth, then the site would be re-seeded and the site would likely return to pre-project conditions the following growing season. Vegetation management in serpentine communities is likely to result in the permanent loss of such vegetation. Wet season work may result in water quality issue in the canals or the streams to which they connect. Distance to the closest stream and the nature of the canal in the intervening reach will affect the degree to which this potential effect is observed. For example, if the canal is vegetated downstream of the project site, then sediment may be filtered or settled out before reaching the stream connection. Implementation of avoidance and minimization measures described in Chapter 6 will help reduce such potential effects.

Other projects covered under this category are expected to result in temporary reductions in vegetation at project sites.

## **Three Creeks HCP In-Stream Operations and Maintenance**

The proposed Three Creeks HCP describes activities associated with reservoir operations and maintenance, and recharge operations and maintenance. These types of activities will also occur at Uvas and Chesbro dams which are not covered under the Three Creeks HCP but are covered under the Habitat Plan. As such, impact mechanisms for these types of activities are discussed for the entire Habitat Plan study area in the following sections.

### **Three Creeks HCP Conservation Program**

As discussed above, the proposed Three Creeks HCP includes a suite of activities to enhance conditions for steelhead trout and Chinook salmon, while maintaining use of local watersheds to meet the water supply needs of northern Santa Clara

County. The following actions include components of the Three Creeks HCP Conservation Program that are in-stream operations and maintenance activities.

### **Reservoir and Recharge Re-Operation**

The proposed Three Creeks HCP Conservation Program includes modifications of reservoir and groundwater recharge operations to enhance flow, temperature, and water quality conditions in the channels downstream of reservoirs to promote better fish habitat. These activities will be implemented at Coyote Creek, Upper Penitencia Creek, and Alamos Creek (Almaden Reservoir and the Alamos Diversion).

These actions are intended to mimic natural conditions in support of salmonids. They are also expected to have beneficial effects on covered species for this Plan. More natural flow patterns, including large flushes of water, may clear fine sediments from stream channels and vegetation, thus improving egg laying substrate for amphibians. In addition, flow management is expected to support benthic macroinvertebrates which form the base of the stream system food chain.

### **Upper Penitencia Creek Management Program**

The Upper Penitencia Creek Management Program requires specific timing of water supply operations including reservoir releases. These types of activities are discussed above under *Proposed Operating Rules for Reservoirs*. This activity may also require replacement or removal of existing infrastructure. This type of activity could result in impacts similar to those described above for minor construction activities in streams. Potential impacts may include permanent and/or temporary impacts to riparian vegetation and ground disturbance.

### **Supplemental Flow Program**

SCVWD has developed a program to provide supplemental flows to the base of Anderson and Calero Main dams to ensure that the conservation strategy flow targets for summer flow targets can be reliably met under a variety of conditions, such as implementation of DSOD Interim Storage Restrictions, short-term equipment failures, and scheduled and unscheduled maintenance that requires reservoir dewatering. Temporary pipelines will be installed prior to the initiation of a dewatering event and when supplemental flows are required. Temporary pipelines will be removed when supplemental flows are no longer needed.

The source of supplemental flows varies from reservoir to reservoir and provision of flows may require installation of a temporary pipeline, use of trucked water, bypass of flows from upstream of the reservoir, use of imported water, or installation and use of a new groundwater pumping system including new pipelines. Imported or recycled water will only be used if it can meet temperature and water quality criteria. Although uncommon, it is possible that imported water contain exotic fish or other invasive species. While many of these exotic species already exist below the dams, increased numbers of exotic species may increase the level of predation on covered species.

New infrastructure installed to provide supplemental flow will be installed along existing roads and pipelines within the disturbed footprint, or within the Dam Maintenance Program area of routine maintenance. Therefore, no additional



impacts to land cover are expected as a result of supplemental flow infrastructure installation.

### **Monitoring Program**

SCVWD will conduct monitoring of species covered by the proposed Three Creeks HCP. The monitoring program will include the same types of activities described below in Section 4.3.7 *Conservation Strategy Implementation*, subheading *Activities within the Reserve System*.

## **4.3.4 Rural Capital Projects**

Rural capital projects (those capital projects occurring outside the planning limits of urban growth) are likely to have the same types of direct, ground-disturbing impacts as development within the planning limits of urban growth. However, like rural development, the severity of impacts associated with rural capital projects is likely to be greater than impacts associated with urban projects because urban projects typically occur in areas that are already degraded. A discussion of direct and indirect impacts associated with the major types of rural capital projects covered by this Plan is presented below.

### **Rural Transportation Projects**

Most of the road projects covered by this Plan are expansions or improvements of existing roads, highways, and intersections. Additionally, VTA plans to install a parallel set of tracks alongside the existing Caltrain route from San José to Gilroy. The County has identified three new roads in the permit area outside of the planning limits of urban growth: a connection of DeWitt Avenue to the West Edmundson Avenue / Sunnyside Avenue intersection near Morgan Hill, a connection on Center Avenue between Omar Avenue and Buena Vista Avenue northeast of Gilroy (requires a new stream crossing), and a connection between Center Avenue and Hill Road across Maple Avenue immediately south of Morgan Hill. VTA is planning to construct one new connector road as part of the U.S. 101 Improvement Project (Monterey to SR 29). This road would be an extension of Santa Teresa Boulevard from Castro Valley Road to U.S. 101 at the SR 25 interchange and requires a new stream crossing. This connector road is just outside of Gilroy's planning limit of urban growth. These projects are anticipated to have permanent, direct impacts on natural land cover types, and therefore on covered species.

Implementation of these projects would result in permanent impacts on land cover within the footprint of each project. Indirect impacts may also occur as a result of expanded roads. In the absence of designs to minimize these effects, wider highways and freeways, already difficult for wildlife to navigate, will intensify road crossing hazards for wildlife and result in increased vehicular strikes. The disruption of wildlife movement results in increased habitat and population fragmentation by creating more extensive and obstructive barriers between populations and habitats. Expanded roads that support a higher volume

of traffic may also result in increased runoff of car waste (e.g., oil, grease, radiator fluid) and debris (e.g., tires, litter, car parts), which may be hazardous to wildlife. Increasing the total amount of roads, even dirt roads, can lead to increased sediment in the watershed from concentration of hillslope and surface runoff, which causes higher peak flows and contributes to bank erosion. In addition, expanded roads can create substantial noise and physical disturbance that may disturb or disrupt covered species far from the road. Finally, as discussed above in Section 4.3.1 *Urban Development* increases in vehicular traffic will result in increased nitrogen deposition in areas adjacent to roadways.

Road expansion projects adjacent to cultivated agricultural areas are expected to have less severe direct and indirect effects than road projects adjacent to natural land cover types because the habitat value of cultivated agriculture is lower. Measures to avoid and minimize the impacts of covered transportation projects, including design measures for new and expanded rural roads, are described in Chapter 6.

## South County Airport Expansion

Permanent and temporary direct impacts related to the proposed expansion of the South County Airport as identified in the South County Airport Master Plan are similar to impacts of other capital projects that result in the conversion of non-developed land–cover types to developed uses.

Indirect impacts associated with expansion of the South County Airport include increased noise due to higher usage. Lighting improvements proposed in the master plan may also have indirect impacts on covered species if bright lights are used at night. However, the South County Airport is located in a rural residential area just west of U.S. 101. While ruderal and annual grassland habitats on this project site and in surrounding areas support foraging habitat for many raptor species, the indirect impacts associated with increased noise and/or lights are expected to be minimal. Though suitable habitat for western burrowing owl is present in and around the South County Airport, there are no recent occurrences of western burrowing owls breeding at the site. If the species colonizes the airport, expanded operations may have indirect effects through increased lighting and noise. These potential indirect effects are not anticipated to preclude use by burrowing owls, as demonstrated by the continued use by this species of the San José International Airport nearby, which has much greater levels of aircraft activity and generates much more lighting and noise than would be generated by the South County Airport expansion. Should this species be documented at the site prior to airport expansion, the conditions on covered activities, described in Chapter 6, would be employed to minimize effects.

Expansion of the airport runway is not anticipated to result in increased bird strikes; however, increased use of the airport (i.e., more flights) may result in increased bird strikes. Approximately 100 new hangars were completed at the South County airport in 2005. The master plan identifies a potential future increase in the number of hangars, tiedowns, and fixed base operators that can be accommodated at the airport. Such expansion is likely to lead to increased use of

the airport as a result of more pilots choosing to base their planes at the airport as the population and the abundance of commercial and industrial activities around the airport grow. The extent to which bird strikes may increase is unknown at this time. As noted in Chapter 2, the NEPA/CEQA environmental compliance documents for the proposed master plan have not yet been prepared. However, the number of aircraft based at the South County Airport has almost doubled in the past 3 years, and a significant change in the number of bird strikes has not been recorded. Moreover, there have been no reported bird strikes at the airport in the last 8 years (Honaker pers. comm.). It is anticipated that the potential for increased bird strikes will be evaluated in the environmental compliance documents and avoidance measures identified if it is determined that an increase in bird strikes is likely to occur.

## **Kirby Canyon Landfill Development**

Direct, permanent impacts associated with the Kirby Canyon Landfill development in Fill Areas 3 and 4 include loss of natural land cover types in the footprint of the fill areas and of supporting facilities including roads and sedimentation basins. Temporary impacts may occur in areas where the ground is disturbed during landfill operation activities but revegetated to pre-project or ecologically improved conditions within the time allowed for temporary impacts.

Indirect impacts associated with noise and light are not expected to increase over the current level since the Plan assumes that the amount of waste deposited to the landfill (also called the “disposal rate”) will remain consistent with current operations. Indirect impacts could occur if the landfill lining fails, and water that has come in contact with waste (called “leachate”) enters the natural ground or surface water system. However, considerable technological efforts are used to prevent leachate from coming into contact with groundwater, and potential impacts are both regularly monitored and addressed by state over-sight agencies. Overall, landfill design and construction methods are sufficiently advanced that a significant indirect effect is unlikely to occur. If it does occur, the mechanism to stop and repair the impact is in place through agency regulation (i.e., the Regional Water Quality Control Board). This Plan does not authorize take associated with a failure of the landfill lining.

## **Off-Channel Groundwater Recharge Ponds**

Several water supply projects are planned in the permit area during the permit term. These include the development of groundwater recharge sites on the valley floor in the Coyote Valley and around San Martin; and infrastructure, such as access roads and conduits, required to support these projects. Implementation of these projects would result in permanent impacts on land cover within the footprint of each project (i.e., loss of undeveloped land cover types to new structures). As is true of other capital projects, some temporary impacts outside the project footprint are expected during construction due to access and staging

needs. Direct impacts of operating new off-channel groundwater recharge basins include potential entrainment of covered aquatic species in outtakes from creeks.

Increases in the number of groundwater recharge sites may result in an increase in groundwater levels, and thus there is a potential to affect local streams by increasing in-channel flows. This effect is only expected to be observed during winter and spring when surface water is most available and SCVWD is actively working to recharge groundwater basins. Any increase in in-channel flows may help to offset the reduction in winter flows resulting from the operation of reservoirs and recharge ponds described in Section 4.3.3 *In-stream Operations and Maintenance* subheading *Reservoir and Recharge Pond Operation*. However, changes to groundwater levels due to recharge that occur within the same hydrologic unit (e.g., the south county Pajaro River basin) may result in no net change in average groundwater levels over time if the recharge and extraction are occurring at equal levels. This will likely be the situation in an average water year. Wet water years may experience high levels of recharge with reduced pumping and stream flows could increase (consistent with the natural process of a wet water year). Dry water years may result in reduced availability of water supplies, and thus less groundwater recharge will occur, more consistent with existing conditions where no recharge ponds currently exist.

Indirect effects of groundwater recharge basins may result from new ponds supporting nonnative predators of covered species. This potential affect could be exacerbated if the new ponds provide habitat to covered species (e.g., vegetation around ponds) and recreational access to the general public. As discussed above, ponds that allow recreational access may be targets for illegal dumping of invasive species (e.g., bass or red-eared slider turtles) that could prey upon covered species using the ponds.

It is unlikely that these projects would result in unanticipated population growth, because these projects are planned to meet currently anticipated demands.

Other indirect impacts may result from the construction of new access roads in areas of little development. As discussed above, new roads in rural areas can cause habitat fragmentation and obstruction of wildlife movement corridors. However, these factors are unlikely to be an issue for three of the four proposed groundwater recharge ponds, because the ponds are located on the valley floor in Morgan Hill and San Martin in an area that is already urbanized or rural residential. The fourth pond is planned for the Coyote Greenbelt in an agricultural area. Because this area is already developed for agriculture and has development both to the north and south of it, it is likely that existing roads may be used to access the site and that habitat and connectivity will not be further affected.

## Park Facility and Trail Construction

The cities, County, and Open Space Authority will construct new park facilities and trails in the permit area within the permit term of the Plan. Each of the three cities has developed a master plan for parks and trails within respective planning

limits of urban growth. The County has also developed master plans for each of its parks for which new facilities and trails are proposed (see Section 2.3.5 *Rural Capital Projects* for a full list of master plans).

Major components of developing new parks include the construction of a park entrance (if one does not exist), access roads, staging areas, parking areas, and new trails. Construction of these facilities will have permanent and temporary direct impacts similar to those of other capital projects (i.e., permanent conversion of land cover beneath the footprint of the project, with temporary impacts occurring in a buffer zone around the project site). Ground disturbance due to construction would likely increase the spread of nonnative species, especially in areas not previously disturbed. New trails will be sited to avoid streams and adjacent riparian vegetation whenever possible in accordance with the conditions identified in Chapter 6. However, some new trails will require creek crossings that may result in removal of riparian vegetation and construction of bridges. While some temporary impacts on streams are likely to occur during project construction, many impacts can be avoided through implementation of avoidance and minimization measures and other mitigation measures. In addition, permanent impacts on streams can be avoided through use of appropriate design of crossings (e.g., free-span bridges).

New trails may also require construction materials (e.g., rock, soil, clay) that are taken from borrow sites. Specifically, County Parks anticipates using up to 3 acres for development of borrow sites. This amount of borrow would be used across all parks throughout the permit term. Whenever possible, borrow sites will be located so that they can be used to create habitat for covered species (e.g., a borrow site can be used as a created pond for California tiger salamander). In these cases, development of borrow sites will result in the conversion of one land cover type (e.g., grassland) to another land cover type (e.g., pond). Areas around the borrow site may be temporarily disturbed during borrow site construction.

New park facilities will include parking areas, both unpaved and paved, and new trailhead facilities for multiple trail uses which may also include construction of restrooms, fencing, railing, boundary controls, kiosks, and access roads to the trailheads. Whenever possible, these facilities will be developed in existing disturbed areas and are sited to avoid sensitive land covers. Streams and riparian land covers will be avoided entirely. However, some direct loss of non-developed land covers is expected.

Development of new large recreational facilities such as golf courses will have similar impacts as described for urban development. County Parks anticipates that development of such large facilities will occur in valley floor areas in urban or rural residential settings, thus these facilities are more likely to affect urban and agriculture natural communities as opposed to other less developed natural communities and land covers.

In addition to developing new recreational facilities, County Parks anticipates conducting restoration and resource management activities on lands that are not included in the Reserve System. Restoration and resource management projects

on these lands will have similar impacts to those described below under Section 4.3.7 *Conservation Strategy Implementation*.

Indirect impacts related to development of trails and new trailhead facilities are largely related to ongoing anticipated use of trails and facilities, as well as to inappropriate use of trails (e.g., off-trail hiking, illegal dumping). Indirect impacts related to public use of regional parks and open space as described above in Section 4.3.1 *Urban Development* may result from improved trail access to new open spaces, including areas in the Reserve System. These impacts may be minimized through supervision of regional trail use, education of open space users, and restricted or managed access to open space. Indirect impacts may also be related to increased noise in areas where trail head facilities are located, increases in the amount of trash that escape into natural areas and into local streams, and increased use by pets which may harm or harass covered species. Development of fishing ponds and stock ponds may increase the presence of nonnative species like bullfrogs and red-eared sliders that predate on and compete with covered species.

Up to 40 wells or spring boxes may be constructed in County parks. These wells and spring boxes have the potential to indirectly impact seeps, springs, stream flow, and riparian vegetation health. If a well is placed in such a manner that it draws down groundwater levels along a reach of stream, that reach may experience reduced flows. Reduced flows can occur either from a reduction in groundwater supporting the streamflow or from the more rapid percolation of flows from the upper watershed into the channel substrate, filling the space once occupied by groundwater. Reduced flows may degrade aquatic habitat or prevent riparian vegetation from obtaining adequate water. Lowering of the groundwater table could also result in the drying up of seasonal wetlands or seeps. The wells and spring boxes installed in County parks are not expected to have an effect on groundwater level due to the low level of extraction required to support ponds and because wells will be sited to avoid impacts to aquatic land covers. Wells that are found to result in adverse effects to adjacent streams will be decommissioned and sited elsewhere.

A beneficial effect of developing trails in suburban or urbanizing areas, such as the Coyote Valley, is that trails (e.g., Coyote Creek trail within the Coyote Creek Parkway) have been documented to facilitate nocturnal movement of wildlife such as American badgers, bobcats, Tule elk and other species within the riparian corridor and eventually across the valley floor.

## 4.3.5 Rural Operations and Maintenance

Rural infrastructure requiring maintenance includes trails, roads, buildings, and park trailhead facilities. Maintenance activities are generally expected to have minimal permanent or temporary direct impacts because the vast majority of these activities occur within the disturbed roadbed or shoulder or in other areas that have been previously disturbed.

## Utility Maintenance

Existing utility lines, including pipelines, will likely require maintenance and possibly replacement during the permit term. Most of these lines will be underground and may require excavation to access the lines. Direct impacts include ground disturbance resulting from excavation, access, and staging. All natural areas disturbed by utility maintenance activities will be returned to pre-project or ecologically improved conditions in the time allowed for temporary impacts and in accordance with the conditions in Chapter 6 or the impact will be considered permanent. Indirect impacts associated with this activity are similar to those of other ground-disturbing work; such impacts can be avoided and minimized with use of appropriate avoidance and minimization measures described in Chapter 6.

## Facility Maintenance

Facility maintenance refers to maintenance of existing facilities such as buildings, roads, trails, parking lots, airport property, and so on. A large component of this maintenance is vegetation management. Vegetation management along road shoulders and rights-of-way may have the potential to disturb a narrow strip of habitat for covered species and possibly to injure or kill individuals that occur in this habitat. Impacts can be associated with accessing areas, clearing vegetation in order to perform maintenance activities, or managing vegetation to prevent overgrowth and for fire prevention and management. Impacts may also be associated with application of fertilizers or pesticides that are commonly applied to landscaped areas or turf maintained for public parks, play fields, and golf courses. Over application of fertilizer and pesticides may result in these substances washing off the target vegetation and entering local streams where it may cause indirect impacts including algal blooms or mortality of non-target species, including covered aquatic species. Impacts related to vegetation management may be permanent or temporary (e.g., trees completely removed may not reestablish, while mowed vegetation will likely regrow in a short time). Maintenance work involving minor grading or soil disturbance could cause increased sediment discharge into watercourses. However, implementation of standard avoidance and minimization measures should help reduce temporary impacts of such activities.

SCVWD maintains off-channel groundwater recharge ponds. Direct impacts on wetland vegetation around the perimeter of the ponds may result from accessing basins for sediment removal or to clear the areas around intake and outlet structures. Impacts may also occur from annual dry-cycling (when the pond is drained and maintained in a dry condition) which can eliminate aquatic species and standing biomass. This maintenance would adversely affect covered species using the pond; however, it is also beneficial as it eliminates any exotic species or vegetation using the pond. Elimination of exotics also helps slow the spread of exotic species from ponds into surrounding natural areas. These impacts are expected to be minimal and would equal approximately 20 square yards at each facility. Facilities would be maintained approximately once every year (J. Abel

pers. comm.). SCVWD also maintains 39 rain gages throughout the permit area, mostly in the upper watersheds and away from streams. Maintenance activities focus on vegetation clearing to maintain the catch of the gages. In addition, some vegetation clearing may be required to access gages from roads or trails.

The County of Santa Clara conducts maintenance of its facilities including, but not limited to, medical facilities, correctional facilities, shelters, shooting ranges. Some of these activities may directly affect non-developed land covers or result in indirect effects similar to other effects described in this section (e.g., temporary loss of natural land covers, temporary increases in light and noise pollution).

County Parks conducts maintenance of infrastructure such as trails, roads, parking lots, and offices that may include treatments such as mowing for fuel breaks. Such maintenance could result in direct temporary impacts, especially if work is conducted on trails through sensitive land cover types. However, as a natural resource management agency, County Parks implements avoidance and minimization measures and strives for zero impact in all its operations. Any impacts on upland land cover types resulting from operations and maintenance in County parks is likely to be minimal.

Vegetation management conducted during the migratory bird breeding season could result in the loss of habitat for migratory covered birds such as western burrowing owl, least Bell's vireo, or tricolored blackbird. The Habitat Plan requires that vegetation management occur outside the migratory bird nesting period, or surveys will be conducted before clearing to avoid these impacts (see Chapter 6, Section 6.3, subheading *Condition 1 Avoid Direct Impacts on Legally Protected Plant and Wildlife Species*).

Rodent, pest, and invasive plant species abatement activities may be conducted for facilities maintenance. Animal traps, pesticides, and herbicides may be used to control rodents, pests, and invasive plant species. Pesticides and herbicides have strict handling and application requirements; however, potential indirect effects include potential effects on non-target species by applied chemical treatments. For example, pesticide placed for rodents could affect California tiger salamanders seeking refuge in rodent burrows. These potential effects will not be covered under the Section 10(a)(1)(B) permit.

## Pond Maintenance

Pond maintenance outside the Reserve System will be implemented consistent with the covered activity description in Chapter 2 and conservation actions for pond maintenance in Chapter 5. Impacts will be consistent with those described below in Section 4.3.7 *Conservation Strategy Implementation* subheading *Activities within the Reserve System*.



## SCVWD Pipeline Maintenance Program

SCVWD developed an EIR for the Pipeline Maintenance Program that identifies direct permanent and temporary impacts of a variety of activities, including staging, off-road access, pipeline drainage, excavation, and repair. Impacts may affect aquatic resources and riparian or upland natural communities. Direct impacts associated with staging are similar to other staging impacts described above. Off-road access may cause temporary impacts on upland vegetation around accessed pipelines or on riparian vegetation where creek access points are established so that blow-off (pipeline drainage) can be directed to local watercourses. Off-road access may also result in direct mortality or injury of covered species. These effects will be minimized because SCVWD will use existing access roads wherever possible and will limit off-road travel to disturbed areas. Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants. Blow-off may cause disturbed soil and vegetation at blow-off locations, increased flows in the receiving channel, and channel erosion. Excavation may be required to access buried pipelines in upland or riparian areas.

SCVWD will utilize avoidance and minimization measures to reduce the level of impact caused by these covered activities (see Chapter 6).

Indirect impacts associated with the Pipeline Maintenance Program include temporary increases in dust and noise around project areas. Off-road vehicle travel could also result in the spread of nonnative invasive plants. Other indirect impacts may result from temporarily altered flows downstream of the site where pipeline water is discharged. Changes in flow could result in impacts similar to those described in Section 4.3.1 *Urban Development*. However, the scale of impact would likely be much smaller due to the frequency of maintenance (no more than 10 blow-offs per year and maintenance of up to five pipelines per year) and the implementation of avoidance and minimization measures. Additional indirect impacts could occur if blow-off water is a different temperature than stream flow, causing a temperature fluctuation in the stream.

### 4.3.6 Rural Development

Rural development, or exurban development, is loosely described as low-density development at or beyond the rural-urban fringe (Glennon and Kretser 2005). Direct and indirect impacts related to rural development are similar to those discussed above in Section 4.3.1 *Urban Development*. Many important causes of habitat loss and fragmentation stem from changes of land use on private lands, especially conversion of agricultural lands to residential development (Theobald 2003). Development of homes and associated structures (e.g., roads, garages, barns, stables, vineyards) and non-residential development (e.g., telecommunications facilities, agricultural structures, rural commercial development, recreational use areas) in rural areas, including ranchland, will have direct impacts on natural land cover types in areas where structures and infrastructure are built. While the footprint of development per acre may be

lower, the impact of habitat fragmentation is higher in rural areas than in urban areas, because the existing landscape is generally less disturbed prior to project construction. From an ecological perspective, this dispersed pattern of development effectively maximizes the individual influence of each home on the land (Lenth et al. 2006).

Moreover, private roads and driveways are often required to access rural homes; such roads further fragment the landscape and potentially degrade movement corridors for covered species. New roads can also create new hazards or barriers to other native species that depend on long-distance dispersal and movement for survival (e.g., American badger, Tule elk, black-tailed deer, bobcat, mountain lion). Finally, roads and other linear projects create dispersal corridors for nonnative plants. Exurban development tends to result in an increase in generalist wildlife species commonly found in urban areas (e.g., opossum, skunk, coyote, American crow), and a decrease in specialized or human-sensitive species (Glennon and Kretser 2005; Lenth et al. 2006). Such trends decrease the health of natural communities and could result in harm of covered species. Cumulatively, these rural development projects fragment the landscape and make it more likely that wildlife populations will become segmented and isolated.

Impacts from light pollution and noise may also be more significant when introduced into areas where they did not previously exist. Noise from vehicle traffic can disrupt nesting birds and typical movement patterns of terrestrial animals. New sources of light in formerly unpopulated areas can affect the ability of some species—especially birds, bats, and many species of insects—to navigate at night.

In addition to residential development, industrial private development projects include the Z Best Composting facility, the Pacheco Pass Landfill, and Freeman Quarry. The County has identified three public projects that may require ground disturbance: James Ranch and Holden Ranch (separate facilities but physically adjacent), the Muriel Wright Center, and the Mariposa Lodge and Sheriff's Firing Range (separate facilities but physically adjacent). These activities would also result in conversion of natural or semi-natural land cover types to developed land cover types and result in similar impacts as described for other rural development projects. The Mariposa Lodge and Sheriff's Firing Range facilities are located in serpentine bunchgrass grassland and implementation of this project is expected to affect up to 27.5 acres of this land cover type.

Indirect impacts on natural land cover and covered species may result from an increase in impermeable surfaces; as described above in Section 4.3.1 *Urban Development* such increases can result in impacts on streams. Additional indirect impacts on streams could result from the use of septic systems. If leach fields are sited too close to waterways, the nutrient-rich liquid exiting the septic tank may travel into the waterway and cause abundant algal growth, degrading water quality. Leach field seepage may also alter the native vegetation if nutrient-rich water reaches the surface. Within the study area, water quality impacts may arise from the use of pesticides and/or fertilizers on small "hobby" orchards or vineyards, or from horses or other livestock that are kept close to streams. Similarly, new agricultural facilities, such as commercial stables, equestrian

event facilities, and wineries, may also produce waste that is rich in nutrients or other potential pollutants for local streams. In addition, exposed soils common to vineyards and equestrian or livestock enclosures are potential sources of erosion and sediment input to streams. This is exacerbated in cases where vineyards are developed in steep terrain. Existing County ordinances, as well as strict NPDES permits overseen by the Regional Boards, require many avoidance and minimization measures targeted at protecting water quality in local streams.

Existing land use restrictions and requirements also substantially limit the footprint and extent of rural development. For example, almost all of the areas intended to be incorporated into the Reserve System (see Chapter 5) are large land holdings designated as Hillside or Ranchland land uses under the County General Plan. In these areas, the maximum development density allowed is one residence per 20 to 160 acres, based on the average slope of a parcel. Subdivision of sites designated Hillside or Ranchland seldom occurs and this pattern is not expected to change during the permit term due to the physical challenges of development in most of the study area. Under County policies, most subdivision proposals for Hillside parcels are required to cluster future development and preserve a minimum of 90% of the site as open space. If suitable (as determined by the Implementing Entity), these large set-asides could be incorporated into the Reserve System. County policies and regulations also require that grading be minimized in Hillside and Ranchland areas through the site design process, which emphasizes compact development. These land-use restrictions help to minimize the effects of rural development on covered species and natural communities.

### 4.3.7 Conservation Strategy Implementation

Activities related to the implementation of the conservation strategy that may result in impacts are separated into two groups: activities that will occur within the Reserve System and activities that will occur outside the Reserve System. Both groups of activities are described below.

#### Activities within the Reserve System

Activities within Plan reserves are expected to have a net benefit on all covered species (see Chapter 5 *Conservation Strategy*); nevertheless, some conservation actions may have temporary or limited permanent adverse impacts on covered species, resulting in take. In other cases, activities that are designed to benefit one or more covered species may harm another set of covered species. However, the Plan Reserve System is designed to be large and diverse enough to ensure that the net effect of all reserve activities is beneficial to all species across the system.

Some habitat enhancement, restoration, and creation activities may temporarily and adversely affect wildlife habitat. For example, planting emergent vegetation in stock ponds could temporarily disturb amphibians occupying the pond.

Periodic dredging of ponds to maintain pond capacity and habitat quality may also have temporary adverse effects on pond species. The cleared bank conditions that precede establishment of native riparian plants can also trigger rapid establishment of weedy or undesirable aggressive species if these species are not controlled at the site. Man-made livestock pond removal will be only undertaken if removal improves the functional values of the site or if the pond is a safety hazard. If such actions are taken, the Implementing Entity will replace the pond lost with a new pond in another location in the Reserve System consistent with the requirements of the conservation strategy. Naturally formed ponds will not be removed.

Another example of habitat enhancement actions that may temporarily and adversely affect wildlife habitat is road removal. Road removal will only be undertaken if the benefits are determined to outweigh the adverse effects. For example, it may be appropriate to remove a road that is poorly sited such that it is contributing to localized erosion. It may not be appropriate to remove a road that is not causing other adverse impacts. In such cases, instead of removal, a road may simply be closed off from access.

Monitoring and research activities required by the Plan (see Chapter 7 *Monitoring and Adaptive Management Program*) may also disturb wildlife. For example, in order to determine the presence of some covered species (e.g., California red-legged frog tadpoles), individuals must be handled by a qualified biologist. Such handling constitutes harassment—a form of take—under ESA and requires authorization. All biologists conducting monitoring under the Plan (i.e., Implementing Entity staff or their consultants) will be covered for their monitoring activities should any take occur. See Chapter 6, Section 6.8.5 *Item 5: Results of Applicable Species Surveys and Monitoring* for details on biologist certification to conduct monitoring activities. Translocation activities, which must be coordinated with and approved by the Wildlife Agencies, could also cause take through injury or loss of individuals due to capture, handling, transportation, release, and/or the inability of the individual to find new shelter.

Terrestrial management activities may also disturb or inadvertently harm covered species. For example, fuel breaks must be created in key areas of the Reserves to minimize the risk of wildfire and to protect structures and adjacent lands. Creating and maintaining these fuel breaks may have minor adverse effects on grassland-dependent species such as western burrowing owl and Bay checkerspot butterfly. Prescribed burns will be designed to provide long-term net benefits to natural communities and covered species. However, these burns may result in take of some covered species during the burn. For example, burns in serpentine grassland may adversely affect serpentine covered plants or take Bay checkerspot butterfly larvae. Prescribed burns in annual grassland may temporarily adversely affect western burrowing owl (although burns may also provide new sources of prey to these species, such as insects escaping flames and smoke). Wildfires may have similar adverse effects on covered species as prescribed burns, but these effects may be more severe due to the greater size and intensity of wildfires.

The conservation strategy calls for installation of up to 49 wells to support ponds in the Reserve System. Potential indirect effects related to the installation of

groundwater wells were previously described in Section 4.3.4 *Rural Capital Projects* subheading *Park Facility and Trail Construction*. The groundwater wells installed to support ponds in the Reserve System are not expected to have an effect on groundwater level due to the low level of extraction required to support ponds and because wells will be sited to avoid impacts to aquatic land covers. Wells that are found to result in adverse effects to adjacent streams will be decommissioned and sited elsewhere.

Recreational or management facilities built and maintained within the Reserve System could result in a small amount of habitat removal. Facilities will be sited and built to avoid or minimize their effects on covered species, but a small amount of take may nevertheless occur. The Permittees are covered for incidental take of covered species resulting from public use within the permit area, inside or outside of the designated Reserve System, provided that usage is consistent with park management plans and the guidelines of this Plan. Although the permits do not cover incidental take for private individuals, recreational activities allowed on reserves are expected to have some minor impacts on covered species. Heavily used trails would result in some permanent indirect impacts on wildlife habitat connectivity. Since wildlife is most active at dawn and dusk or at night, disruptions of wildlife movement are not anticipated to be significant. Trails can fragment otherwise intact landscapes and can also facilitate predator movements and invasion by nonnative animals (e.g., feral cats, dogs, pigs). Trails are often a source of invasion by nonnative plant species that are transported into the reserve by trail users. As described in Chapter 5 *Conservation Strategy* recreational uses will be limited to low-intensity activities such as hiking, wildlife observation, horseback-riding and non-motorized bicycling. Any new trails will be carefully sited and maintained to minimize the disturbance of habitat and wildlife, as well as sited and maintained to avoid disturbance of cultural and archaeological resources within reserve areas. Despite these restrictions, some take in the form of harassment associated with recreational activities is expected to affect covered species that are sensitive to human disturbance.

Implementation of the Plan conservation strategy could also affect covered plants through habitat enhancement or restoration and creation which could result in removal of or degradation to species habitat. Plant populations in the Reserve System could also be temporarily affected by management activities such as prescribed burning or livestock grazing although the long-term effects of these activities are expected to be positive. The Plan also includes many types of monitoring which can occasionally have impacts on individual plants in the form of trampling or soil disturbance. In all of these cases, the benefits from Plan implementation are expected to greatly outweigh any negative effects of implementation on the covered plants.

In addition to the conservation actions described above, it will also be necessary for the Implementing Entity to install or replace infrastructure in the Reserve System including signage, fences and gates, field facilities, dirt roads, paved roads, vehicle bridges, and culverts in order to conduct required management and monitoring activities. These activities would have permanent impacts similar to other covered activities. Temporary construction impacts are likely as well. All

facilities within the Reserve System will be sited on already disturbed areas to the extent possible and in areas that minimize effects on covered species. All activities will comply with the conditions on covered activities in Chapter 6.

## Activities outside the Reserve System

The Plan proposes to conduct stream and riparian restoration and other conservation actions, including removal of invasive weeds (e.g., *Arundo donax*), that will occur outside the Reserve System. As discussed in Chapter 5 (Section 5.2.3 *Reserve System*), these actions will require agreements to be reached with landowners regarding the installation and maintenance of the conservation actions. The Plan also calls for management of western burrowing owl, and the possible creation of a Coyote ceanothus occurrence outside of the Reserve System.

Stream and riparian restoration activities may result in temporary direct impacts during construction including loss of vegetation during restoration project construction, or removal of invasive weeds. All areas that experience reduced vegetative cover during construction will be replanted and monitored, in accordance with Chapter 7, to ensure that riparian vegetation reestablishes as part of the restoration project. As with implementation of conservation actions inside the Reserve System, these conservation actions are expected to have a net benefit on covered species that utilize stream and riparian habitats.

Burrowing owl management actions could occur on managed lands outside the Reserve System. These activities will likely occur on sites that have been previously impacted (e.g., capped landfills) as well as at sites that are more natural in nature (e.g., foothill grasslands). Burrowing owls prefer nesting sites with ample burrows, low slopes, and short grass. As such, a key management action will be to mow or graze management sites. It is not expected that this management will affect many other covered species as burrowing owl nesting habitat does not extensively overlap with habitat of other Plan covered species. However, if areas in the foothills are managed for owls, there is the potential for these sites to be also used by California tiger salamander or California red-legged frog for refugia. These species, as well as burrowing owl, may be temporarily affected by management activities due to presence of people, livestock, or equipment.

The Plan allows for the creation of new Coyote ceanothus populations outside the Reserve System. Coyote ceanothus is a large, woody shrub that often grows in dense, monotypic stands. Because of the possibility that a new creation could displace serpentine grasslands, siting of a created occurrence will minimize the potential for displacement of habitat for other covered species. The Implementing Entity will develop a plan with the Wildlife Agencies for the occurrence creation. The plan will include measures to avoid other covered species.

Monitoring for covered species and natural communities will also occur outside the Reserve System in the situations described above. Some monitoring actions

may result in temporary harassment of covered species in order to identify, measure, or tag individuals.

## Neighboring Landowner Assurances

Because the conservation strategy aims to increase populations of covered species through habitat enhancement, restoration, and creation, certain species may disperse out of the Plan reserves where active management is undertaken and onto neighboring private lands. This Plan includes a Neighboring Landowner Assurances program to protect landowners in the permit area near reserves from the regulatory consequences of special-status species dispersing onto their property. Private lands within 1 mile of the Reserve System that are actively used for agricultural purposes (e.g., crop production) will receive take coverage under the Plan. The rationale for the 1 mile radius is described below. Coverage for nonagricultural lands is unnecessary because take coverage is already provided for urban and rural development; see Chapter 2.

Coverage will be provided to agricultural operations only for take beyond the baseline condition that existed prior to the establishment of the neighboring Reserves and only for ongoing and routine agricultural activities<sup>5</sup> on lands enrolled in the Neighboring Landowner Assurances program. Participation in this program is voluntary and landowners will be able to opt in for coverage. Coverage under the Neighboring Landowner Assurances program expires when the permits expire. See Chapter 10, Section 10.2.7 *Assurances for Private Landowners* for additional details of this program.

The impacts associated with the dispersal of covered species onto neighboring lands are anticipated to be very limited and restricted to species that meet the criteria listed below.

- Species that are expected to increase in numbers on the Reserves.
- Species that are likely to spread onto neighboring lands as populations increase.
- Species for which there is a reasonable likelihood of take from routine, ongoing agricultural activities.

The Neighboring Landowner Assurances program will extend coverage only for three species: western pond turtle, California red-legged frog, and California tiger salamander.

Although California tiger salamander, California red-legged frog, and western pond turtle are capable of dispersing further than one mile, a one mile buffer was chosen to account for typical dispersal range of these species. Covered species are expected to disperse or move more than 1.0 mile but this radius accounts for the most likely area of effect into neighboring lands.

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<sup>5</sup> See Chapter 2 for a definition of ongoing and routine agricultural activities.

Based on the landowner participation in other counties with approved HCPs that have similar programs (e.g., San Joaquin County), it is assumed that up to 10% of eligible lands will enter into neighboring land agreements, or no more than 2,040 acres. Of this, it is assumed that most of the potential impacts will occur on land cover types that support farming (agricultural and grassland land cover types) which are used by California tiger salamander, California red-legged frog, and western pond turtle for non-breeding or dispersal habitat, not as breeding or primary habitat. The estimated range of acres impacted represents between 0.1% and 0.6% of modeled habitat for the species covered in the Neighboring Landowner Assurances program.

Adverse effects from allowable agricultural activities on western pond turtle, California red-legged frog, and California tiger salamander could result from rodent control, active farming practices, vehicle and machinery travel, runoff from fields, or disturbance to adjacent streams or wetlands. The habitat for these three species is typically of low quality (and non-breeding), so the magnitude of impacts is expected to be low or very low.

Like Safe Harbor Agreements offered by USFWS, the Neighboring Landowner Assurances program does not allow take of species present before the Reserve was established; rather, coverage is restricted to species that disperse onto lands after the creation of the neighboring reserve. Take granted through the Neighboring Landowner Assurances program may slightly reduce the beneficial effects of the conservation strategy. The Neighboring Landowner Assurances program is described in detail in Chapter 10 *Assurances*.

## 4.4 Impact Assessment Methods

Implementation of covered activities will result in some incidental take of covered species. To meet regulatory requirements, to properly mitigate effects, and to distribute fees equitably, the amount of take must be discussed and, if possible, quantified. The allowable amount of take from permanent and temporary direct impacts is quantified by estimating impacts on land cover (methods for impact estimation are described below) (**Table 4-2** and **Table 4-3**, respectively). The total impacts by land cover type shown in these tables are the allowable impacts under the permits and the primary way in which impacts will be tracked during implementation to ensure permit compliance. Impacts to plant populations will also be tracked to ensure permit compliance, as described below under *Effects on Plant Occurrences*.

**Figure 2-6** and **Figure 2-7** show where many of the capital improvement projects proposed for coverage under this Plan are occurring. The amount of take is also described by estimating permanent and temporary direct impacts on modeled habitat for covered species (**Table 4-4**) and on plant occurrences (**Table 4-6**). If species habitat is not modeled, then land cover proxies are developed. The amount of take from indirect impacts is discussed qualitatively. A discussion of how the impact estimates were derived is provided below in Sections 4.4.1 *Direct Effects* and 4.4.2 *Indirect Effects*.



Because of the broad geographic and temporal scope of the Plan, the impact assessment has been conducted at a programmatic level. The impact numbers presented in this Plan are intended to reflect approximate losses and impacts rather than a precise quantification of impacts on land cover types. Total allowable impacts as described and quantified in the Plan (see **Tables 4-2, 4-3, 4-4, and 4-6**) represent the limit, or cap, on total impacts allowable under the Plan. Once these impact levels are reached, no further take is permitted pursuant to the Plan. Covered activities described in Chapter 2 do not have project-specific impact limits, although activities must be implemented consistent with the conditions described in Chapter 6. The Implementing Entity tracks impacts during Plan implementation to ensure that no covered activities are conducted beyond the capped impacts. As covered activities are implemented, specific impacts will be more accurately quantified. In general, project-specific impacts will be quantified in conjunction with the CEQA process and/or the development permit application process with a local jurisdiction (see Chapter 6). The goal of the impact analysis is to identify practical and appropriate impact assumptions to ensure the Local Partners full coverage for implementing covered activities throughout the permit term and to adequately fund the conservation strategy.

#### 4.4.1 Direct Effects

As described in Chapter 2, the covered activities are broad in scope and address the needs of all Local Partners. To quantify direct impacts on land cover types and streams, covered activities were grouped as they are in Chapter 2. These categories are Urban Development, In-Stream Capital Projects, In-Stream Operations and Maintenance, Rural Capital Projects, Rural Operations and Maintenance, Rural Development, and Conservation Strategy Implementation. Two additional categories—In-Stream Construction and Rural Construction—were added to address temporary, one-time impacts associated with construction of identified capital projects. In-Stream and Rural Construction impacts were identified for the area immediately adjacent (i.e., the area immediately surrounding the project area) to capital project footprints to account for the staging of project construction. As previously defined in Section 4.2 *Definitions*, temporary staging areas would result in temporary impacts to land cover; and will be returned to pre-project or ecologically improved conditions within the time allowed for temporary impacts. Major individual and collective projects or activities with the potential for significant impacts were identified for each category. Smaller-scale activities such as vegetation management and monitoring are captured in the analysis of operations and maintenance impacts. Covered activities that affect very small areas (less than 0.1 acres) were not individually assessed. These activities are still covered under this Plan; however, impacts related to these activities are assumed to be absorbed by the impact estimates developed for larger covered activities. Examples of such covered activities include off-trail monitoring and management activities conducted as part of the conservation strategy implementation.

In addition to grouping activities by the nine identified categories, impact mechanisms within each category were analyzed as either permanent or

temporary. While the impacts from covered activities have both permanent and temporary aspects (see Section 4.3 *Impact Mechanisms*), in most cases the associated impacts are largely either temporary or permanent. To facilitate the analysis and because parsing temporary and permanent impacts within categories would have a minimal effect on the results due to the programmatic nature of the analysis, only the dominant impact type is considered in each category.

Categories identified as having permanent impacts to land cover and species habitat are Urban Development, In-Stream Capital Projects, Rural Capital Projects, Rural Development, and Conservation Strategy Implementation. These categories were identified as permanent because they generally include the construction of structures that would result in permanent loss of the land cover on which they are built. Conservation Strategy Implementation falls into this category because of the permanent impacts associated with constructing new facilities such as fire/access roads, trails, visitor centers, and kiosks.

Categories identified as primarily<sup>6</sup> having temporary impacts to land cover and species habitat are In-Stream Operations and Maintenance, In-Stream Construction, Rural Operations and Maintenance, and Rural Construction. Operations and maintenance and construction impacts were considered temporary because operations and maintenance and construction activities were assumed to affect natural land cover types for a limited time and because these sites would return to pre-project or ecologically improved conditions within the time allowed for temporary impacts. Examples of temporary impacts include mowing and construction staging, which generally take place adjacent to a project footprint. Three exceptions to this grouping specifically called out in the Section 4.3, *Impact Mechanisms*, are SCVWD's Dam Maintenance Program, SCVWD's water supply operations and maintenance, and SCVWD's one-time vegetation management in lower Llagas Creek. Areas maintained under the Dam Maintenance Program and for water supply operations and maintenance (e.g., diversions structure and stream gage maintenance) will be maintained at such a level that the impacts will effectively result in a permanent loss of vegetation. Similarly, once vegetation in lower Llagas Creek is initially reduced, it will then be maintained under the Stream Maintenance Program. The initial reduction in vegetation is therefore more accurately a permanent reduction. Both of these covered activities are assessed as permanent impacts under the In-Stream Capital Project category.

Impacts on streams were identified in all impact categories as appropriate (i.e., for all projects that may have in-stream impacts). A permanent impact on a stream results from a loss of natural structure or function. Examples of activities resulting in permanent stream impacts include installing hardscape in the channel, culverting the channel, constructing a new bridge over the channel, or reducing channel complexity (e.g., removing riffle, runs, or pools). Examples of temporary stream impacts include dewatering, removal of in-stream vegetation so

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<sup>6</sup> The assumption that operation and maintenance activities would result primarily in temporary effects was made for the purposes of estimating impacts for the Plan. The nature of impacts, whether temporary or permanent, will be determined on a project-level basis through the application process described in Chapter 6, where the frequency, duration, and nature of the impact will be documented.

that in-stream habitat is affected, and other actions that temporarily reduce stream function and habitat value.

Impacts to known occurrences of plants are assessed by plant occurrence and location. Methods and assumptions used for estimating impacts to covered plant species are described below.

## Baseline Land Cover

To estimate impacts resulting from implementation of covered activities over the course of the permit term, it was first necessary to identify the baseline conditions on which the impacts are assumed to occur (i.e., the anticipated composition and distribution of land cover at the time the Plan is implemented). Establishing a baseline helps to ensure that the amount of permanent impacts estimated in this Plan, particularly within the planning limits of urban growth where impacts are assessed by land use, are appropriately scaled (i.e., to ensure impact are not overestimated). Working with each of the cities and the County, parcels currently permitted for development or anticipated to be permitted by the time of Plan implementation<sup>7</sup> were excluded from the impact analysis and therefore considered part of the baseline conditions. Assumptions used to define the impact analysis baseline land cover are made only for the purpose of estimating an accurate level of take proposed for coverage under the Plan; these assumptions have no bearing on whether an activity may be covered or not. Project proponents for parcels assumed to already have permits may seek coverage under this Plan if the activity is covered, take coverage is available, and if the proponent follows the application requirements described in Chapter 6 (such coverage would be tracked and counted against allowable impacts).

Other parcels and sites were excluded from the impact analysis on the assumption that the existing land cover on these sites would not change substantially within the permit term or that the site was not zoned for urban development. Covered activities may still be implemented in these areas but these covered activities will not substantially change the land cover type (e.g., operations and maintenance activities). Areas excluded for the purposes of identifying baseline conditions are listed below.

- Parcels currently permitted for development or anticipated to be permitted by the time of Plan implementation<sup>8</sup>.
- Land use categories Rural Parks and Open Space, Urban Parks and Open Space, Agriculture, Ranchland/Woodland, and Water within the planning limits of urban growth (impacts are assumed to occur on these land uses outside the planning limit of urban growth).

<sup>7</sup> *Permitted* means a local land-use permit such as a building permit or grading permit. Some projects may not yet have endangered species permits, but they could not be covered by this Plan because they would obtain their local approvals before the Plan is completed.

<sup>8</sup> These parcels were only removed for the land cover impact analysis to ensure that land cover impacts were not over estimated. These parcels were not removed for the species and critical habitat analyses.

- Wastewater treatment ponds in Gilroy.
- The Norman Y. Mineta San José International Airport.
- The Reid Hillview Airport.
- State Parks lands.

## Effects on Land Cover and Streams

Various methods were used to quantify impacts on land cover and streams. An attempt was made to use a consistent approach; however, impacts of covered activities identified in *Urban Development*, *Rural Development*, and *Conservation Strategy Implementation* were calculated using a different method than most of the impact analyses. The sections below describe the methods utilized.

For all analyses, results were only considered to be impacts if the activity affected *natural* land cover types (i.e., land covers not already developed) or Agricultural and Developed natural community land cover types that may have some habitat value. Developed land cover types considered to hold some habitat value are Rural-residential, Golf courses/Urban parks, Barren, and Ornamental woodland. Non-assessed land cover types are the Agriculture developed/covered agriculture, Urban-suburban, Reservoir, and Landfill types.

### General Method

The analyses for In-Stream Capital Projects, In-Stream Operations and Maintenance, Rural Capital Projects, and Rural Operations and Maintenance were conducted in the same general manner. Wherever possible, the impacts of specific covered activities on land cover were modeled using GIS software. The general approach was to utilize a GIS overlay of project footprints or infrastructure on the mapped land cover and assess affected acres. To assess construction and operations and maintenance impacts, buffers were applied to GIS-mapped infrastructure or projects. The assumption is that some amount of surrounding acreage would be the target area for operations and maintenance and construction activities, such as vegetation management and staging, respectively. The same approach was used to assess miles of stream affected by covered activities.

Where GIS data were not available, assumptions were developed to describe the activity and estimate impacts. This process generally entailed describing the acres of impact likely to result from a specific activity, then distributing the acres of impacts across the land cover types likely to be affected by the activity. For example, to conduct the bridge construction/reconstruction analysis, existing bridge length and width information was used to quantify the amount of existing bridge that would need to be replaced within the permit term. An assumption for the amount of bridge expansion that would be required based on changing safety standards was also applied. Impacts of bridge construction were assumed to

affect only the riparian corridor and associated stream. Accordingly, the acres of impact were assigned proportionally to the riparian land cover types within the jurisdiction in which the activity was occurring (e.g., bridge reconstruction impacts in San José were assumed to affect riparian land cover types in proportion to the percent of riparian land cover types in San José).

To identify miles of stream impacts where GIS data were not available, assumptions were developed on the basis of the activity or project description, known or approximated number of stream crossings, and assumptions on crossing width. For example, stream impacts for most bridge projects were estimated based on total number of replaced bridges multiplied by an average assumed bridge width.

Overall, 30% of all estimated permanent impacts were calculated outside of GIS. Of this 30%, 57% of the estimated impacts are attributed to rural development. Approximately 25% of total estimated permanent stream impacts were calculated outside of GIS. For temporary impacts, approximately 41% of all estimated impacts were calculated outside of GIS. Approximately 5% of estimated temporary stream impacts were calculated outside of GIS.

**Tables 4-5a through 4-5f** provide a summary of the methods and key assumptions used to conduct the impact analysis. These tables are not intended to be exhaustively inclusive of all covered activities. Rather, these tables show how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in these tables. Impacts of these minor activities are assumed to be addressed sufficiently by the approach taken in the impact analysis. Although these tables quantify impacts by project and by each Permittee, this was done for estimation purposes only. Compliance with this Plan will not be measured according to the estimated impacts for each project or Permittee, but rather by total land cover/habitat type impacted by the covered activities as a whole.

## Method for Urban Development

The analysis for urban development did not attempt to discern the impact of individual, separate activities, but rather assumed that all areas within the planning limits of urban growth for the three cities with current land use designations of urban development or rural residential development (as identified in **Figure 2-2, Land Use Categories**) would be fully affected (i.e., converted to a developed land cover). This assumption does not preclude covered activities from occurring on land uses for urban parks, agricultural, or woodland and rangeland; however, it is assumed that the majority of impacts inside the planning limits of urban growth will occur in areas with urban development land uses. This method also assumes that land uses inside planning limits of urban growth will remain approximately the same over the course of the permit term. As is shown in **Figure 2-2**, the majority of current land use is already urban development with some rural development. This approach will likely result in an overestimate of impacts because some of the Biological Goals and Objectives for

plants include commitments to preserve existing populations (e.g., Coyote ceanothus, Metcalf jewelflower) that are located within the San José, Morgan Hill, or Gilroy planning limits of urban growth. There are two exceptions to the assumption that all current land use designations of urban development or rural residential development will be fully affected. First, in-stream areas (Plan-identified streams, including channel bed and banks, and any adjacent riparian land cover types) were excluded from the Urban Development impact analysis and were assessed under In-Stream Capital Projects or In-Stream Operations and Maintenance on a project-by-project basis. Second, impacts occurring in the City of San José Coyote Valley Urban Reserve and the South Almaden Valley Urban Reserve; the City of Morgan Hill Southeast Quadrant; and the City of Gilroy Hecker Pass Specific Plan are assumed to be developed consistent with rural development. Impacts associated with urban development and its effects on watershed health and hydrology were assessed through an impervious surface analysis. This analysis is discussed in Section 4.4.2 *Indirect Effects*.

## Method for Rural Development

The method for calculating impacts of rural development was different than that used for other impact categories because the location and amount of rural development is difficult to predict. In addition, parcel sizes of rural development are highly variable, and the impacts of a single home are often not limited to the footprint of the home and access road. The analysis for rural development was based on the following key assumptions.

- Impact footprints of rural development in the future will be approximately one-third smaller than the footprints evident from aerial photo analysis conducted in 2007.
- The pace of rural development during the permit term will continue at approximately half of the average pace evidenced between 1995 and 2004.
- Rural development could occur anywhere in County jurisdiction consistent with County General Plan and zoning restrictions.

To refine the analysis, County planning staff identified development zones where rural residential development is expected to occur within the permit term. Six zones were identified on the basis of similar development patterns, parcel sizes, topography, and other landscape characteristics (**Figure 4-1**). Rural development was estimated for all areas in unincorporated Santa Clara County in the permit area outside open space (Type 1, 2, or 3) and excluding parcels within the planning limits of urban growth, unbuilt parcels approved for development, the South County Airport, reservoirs, SCVWD percolation ponds, and landfills.

## Amount of Rural Development

The estimated annual rate of new home construction in rural areas was based on the average number of residential development permits issued by the County within each development zone from 1995 to 2004 (10 years). The average of 40 permits per year was then applied throughout the permit term for a total of 2,000 permits granted over the 50-year permit term. This amount was then

adjusted downward by just over 50% to account for changing patterns in rural development and the coverage areas on the valley floor (see **Figure 2-5**). In addition, permits were assumed to be distributed throughout each of the development zones, with a greater proportion of the permits assumed to be granted in the valley floor areas. County planning staff verified that each development zone had the capacity to support the projected development. This assessment was based on the number of vacant parcels (parcels with no existing buildings as of the 2005–2006 Assessor’s roll) and slope (parcels with greater than 50% slopes were excluded). Where capacity did not exist in a zone, excess development was reallocated to other likely zones.

The estimate of permits for nonresidential construction sites (e.g., greenhouses, agricultural structures, telecommunication towers, rural commercial development) was based on the average number of permits issued from 1995 to 2006 (12 years). This average of 7.5 permits per year was applied to the 50-year permit term and then also adjusted downward.

In addition, six specific rural development projects (three County projects, two landfill expansion projects, and one quarry expansion project) were delineated in GIS and impacts calculated based on an overlay with the land cover layer. Impacts were aggregated with other Rural Development impacts. (The Kirby Canyon landfill project is considered a rural capital project, not rural development, so impacts were not included in this category.)

### **Footprint of Rural Development**

To translate the number of home sites predicted during the permit term to an estimate of land cover and species impacts, an average footprint of homesites was developed through air photo interpretation. The actual footprint of each homesite was digitized on screen in ArcView on the basis of substantial disturbances visible on the same color orthophotos used to map land cover (see Chapter 3). The landscape features listed below, when occurring as part of a homesite, were considered part of the direct impact footprint of rural development because they contained little or no habitat value for covered or other native species.

- Homes.
- Outbuildings.
- Driveways and parking areas.
- Landscaping and other active outdoor use areas such as lawns.
- Recreational vehicle trails.
- Vineyards or orchards.
- Heavily grazed or disturbed areas with bare soil.
- Barns, stables and corrals.
- Dirt roads.

The final impact footprint of each homesite was identified as all contiguous features listed above, plus a 50-foot buffer. This buffer incorporates a space around the area of direct impacts most likely to be affected by general maintenance and use of the space around homes such as landscaping, gardens, livestock enclosures, small outhouse structures, and defensible space as required by state fire codes. This area around the home is also subject to indirect impacts such as light, noise, and runoff.

To refine the methodology, several groups of test parcels were selected in the Santa Cruz Mountains and the Diablo Range and visited in the field. Once it was determined, based on field testing, that methods were being applied consistently, 1,199 parcels within the available developable area were randomly selected for the sampling (28% of all available parcels). The parcels were stratified between each side of the Santa Clara Valley and the valley floor to ensure a geographically representative sample. Of these, 693 parcels had no visible home sites so were discarded. The final sample consisted of 506 parcels that were digitized. Final parcel sizes and locations varied widely in the study area, consistent with actual patterns.

Based on this random sample, the median impact footprint<sup>9</sup> of rural home sites was 2.6 acres in the valley floor and Almaden zones and 3.3 acres in the near hills and remote hills zones (**Figure 4-1**). These impact footprints were adjusted downward to 2 acres per development permit to account for changing development patterns (R. Eastwood pers. comm.). The average impact footprint for nonresidential development was estimated to be 1.9 acres.

This approach does not account for the impacts of rural development on landscape linkages or wildlife connectivity. Some larger rural development projects may degrade landscape linkages or impede wildlife movement. Because of the uncertain location of these large rural development projects, their specific effects on wildlife connectivity cannot be evaluated at this time. However, the Plan has incorporated mechanisms to evaluate these effects during implementation and ensure that the conservation goals and objectives of this Plan related to landscape linkage and wildlife connectivity are still met. They will be met through land acquisition of key landscape linkages before development occurs (see Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Actions*), or through project redesign (see Chapter 6, Section 6.4.4, subheading *Condition 7 Rural Development Design and Construction Requirements*).

### Calculating the Impacts of Rural Development

To estimate the impact of rural development on land cover, the total number of expected housing units and commercial development sites over the permit term within each development zone was multiplied by the median impact footprint within each zone. These impacts were then distributed across all land cover types determined to be available for development in proportion to the occurrence

<sup>9</sup> The median value was chosen as the best measure of central tendency of the data because of the strong influence of a few data points with very large footprint estimates. This approach was used for the impact analysis estimate only. Fees on rural residential development will be assessed the fee based on their actual project footprint, as defined in Chapter 9.



of each land cover type within each development zone. Land cover types determined to be available for impact are all those land cover types in the permit area except the cases listed below.

- Parcels excluded from the baseline conditions described above.
- Parcels within the planning limits of urban growth.
- The South County Airport<sup>10</sup>.
- Open space types 1, 2, and 3.
- SCVWD groundwater recharge ponds.
- Reservoirs.
- Landfills.
- Areas within the stream setback zone described in Chapter 6 (note that stream and associated riparian land cover impacts were calculated separately from the land cover analysis and are discussed below).

This distribution included urban-suburban, landfill<sup>11</sup>, reservoir and developed agriculture land cover types (the four land cover types determined to have no habitat value and for which no fee is required [see Chapter 9]) as it is assumed that some new rural development will occur in these land cover types. This method may over- or underestimate effects on some land cover types (e.g., chaparral is more abundant on steep slopes where rural development is less likely to occur). However, a simpler approach was preferred over a complex model with many more assumptions due to the programmatic nature of this impact analysis. Acres of impact for each land cover type were then summed across each development zone to determine total impacts. In addition to the impacts calculated using this method, the County is requesting an additional 78 acres of impact allowance for development of new or expansion of existing County facilities (e.g., Mariposa Lodge, James and Holden Ranches, and Muriel Wright Center).

To estimate miles of stream affected by rural development it is assumed that one out of every 10 residential developments permitted would result in an average of 20 feet of linear stream impacts, primarily from construction of an access road (R. Eastwood pers. comm.). To estimate acres of riparian vegetation affected by rural development it is assumed that each creek crossing (one per 10 residential developments) is 40 feet wide (outer edge of riparian corridor to outer edge of riparian corridor) and that the entire area under the crossing represents a permanent loss of riparian vegetation. Multiplying 20 feet (linear feet of stream affected per crossing) by 40 feet by one-tenth the number of anticipated rural residential developments and converting to acres yields a maximum impact estimate for permanent impacts on riparian land cover types due to rural

<sup>10</sup> While rural development (e.g., construction of homes) is not expected to occur on airport lands, the airport expansion is a covered activity. These impacts were estimated using a site-specific approach informed by the airport's master plan.

<sup>11</sup> Note that Kirby Canyon Landfill fill areas 1, 2, and 5 were exempted from the baseline data; accordingly, impacts from rural development would not be distributed to this area.

development. Note that total riparian land cover impacts may be higher if riparian land cover types occur outside the stream setback area and impacts are identified through the land cover analysis described above. While this analysis captures direct impacts to streams, it does not address indirect impacts such as degradation of water quality due to increased development. These types of impacts are assessed through the impervious surface analysis discussed below in Section 4.4.2 *Indirect Effects*. Rural development will be subject to the conditions identified in Chapter 6, including keeping crossings to the minimum amount required per development and avoiding riparian vegetation whenever possible.

### **Method for Rural Development within the Planning Limits of Urban Growth**

The City of San José anticipates some development will occur inside the city limits but outside the planning limit of urban growth. In addition, the Coyote Valley and South Almaden Valley Urban Reserves were removed from the urban development impact analysis, as were Morgan Hill's Southeast Quadrant and the Gilroy's Hecker Pass Specific Plan. For the purposes of the impact analysis, the City of San José assumes three sites will be permitted each year of Plan implementation (A. Danielsen pers. comm.) in areas inside city limits but outside the planning limit of urban growth, and not including the urban reserves. The Coyote Valley and South Almaden Valley urban reserves are assumed to be developed at rates consistent with the rural development impact analysis for the County in the valley floor rural development zone. This development may occur in the Near East Hills, Near West Hills, Valley Floor, and Almaden Valley rural development zones. Average size of development identified for these areas (2 acres) as part of the rural development analysis was utilized for this analysis as well. Total acres of estimated impacts were calculated and distributed proportionately across land cover types inside the San José city limits but outside of the planning limit of urban growth, but excluding the following lands.

- Parcels excluded from the baseline conditions of the Plan.
- Open space types 1, 2, and 3.
- SCVWD groundwater recharge ponds.
- Reservoirs.
- Landfills.
- Areas within the stream setback zone described in Chapter 6 (note that stream and associated riparian land cover impacts were calculated separately from the land cover analysis and are discussed below).

Stream impacts were calculated using the same method as rural development in the county described above.

## Method for Conservation Strategy Implementation

The analysis for Conservation Strategy Implementation was based on those activities expected to occur in the Reserve System as identified in Chapter 2, Chapter 5, and Chapter 9. Estimates were informed by current land management activities of agencies such as the Santa Clara County Open Space Authority that are assumed to be similar to the land management practices that will be applied to the Reserve System. Once an estimate of acres of impacts was developed, the impacts were distributed across the land cover types most likely to be affected by these actions. Capital projects in the Reserve System were assumed to have both permanent and temporary impacts. Temporary impacts were associated with construction activities. With the exception of utility line maintenance in the Reserve System, no additional impacts were assessed for operations and maintenance activities as it is assumed these impacts are very small. See **Tables 4-5g and 4-5h** for the methods and assumptions used for this impact analysis.

No permanent or temporary impacts are identified for conservation actions either because these activities are assumed to have a net benefit on all covered species (see Chapter 5 *Conservation Strategy*) or because these activities result in impacts that are too small to quantify. Grasslands converted to other land cover types as a result of restoration or creation actions will not be counted as an impact. In addition, the grassland removed will not be counted toward the overall preservation goals for grasslands.

## Method for Three Creeks HCP

The draft Three Creek HCP (April 2009) provides an impact analysis of all activities covered under that plan. This Plan integrated the impact analysis methods, data, and/or impact numbers developed for the draft Three Creeks HCP to ensure consistency of impact evaluation between the two Plans.

## Impact Caps on Serpentine Bunchgrass and Wetlands

Three land cover types (serpentine bunchgrass grassland, coastal and valley freshwater marsh, and seasonal wetland) have impact caps that were informed by the impact analysis, but that were set lower than what was estimated by the impact analysis. The reduction in impacts is intended to account for avoidance and minimization that is required by the conditions on covered activities and because the Plan's fee structure provides financial incentive to avoid these land cover types. Setting impact caps on these land cover types ensures that impacts are not over-estimated and that the conservation strategy is developed consistent with the impacts actually expected to occur.

## Effects on Covered Species Habitat

For covered species with modeled habitat, impacts were assessed based on the intersection of covered activities and covered species modeled habitat. This method uses habitat models that identify the location and amount of habitat assumed to be suitable for each species (see **Tables 3-5 and 3-6** and species model descriptions in **Appendix D**). Estimates of incidental take are based on the habitat models developed for 16 of the 19 covered species. As described in Chapter 3, these estimates of suitable habitat are likely to be somewhat inflated (i.e., conservative) because (1) habitat models may overestimate the actual extent of suitable habitat, and (2) not all suitable habitat is occupied by the subject species. Therefore, species habitat is used as a proxy for species occurrence because of the limitations of survey data. Impacts to Bay checkerspot butterfly were capped lower than estimated impacts to account for avoidance of modeled habitat that may be possible for projects where siting is flexible (e.g., rural development).

For covered plants, impacts were also assessed at the occurrence level (assumed to be equivalent to populations; discussed in the above section) because of the stability of plant occurrence locations (i.e., plants move very slowly). For three plant species, sufficient information was not available to create habitat models. In these cases, worst-case assumptions were used regarding the amount of suitable habitat removed by covered activities. Both methods are described in more detail below.

## Effects on Habitat of Modeled Species and Critical Habitat

For the 16 species with habitat distribution models, maximum allowable temporary and permanent impacts on modeled habitat acreages as shown in the models were identified (**Table 4-4**). Critical habitat is designated for three of the covered species (Bay checkerspot butterfly, California tiger salamander, and California red-legged frog) (**Figures 4-4 through 4-6**). Maximum total allowable impacts in critical habitat for these three species are provided in **Table 4-9**. For covered activities with a GIS overlay, the impact analysis was conducted by intersecting the GIS overlay with the modeled habitat of each species (**Appendix D**). For covered activities without GIS data, the following steps were used to identify impacts.

- **Step 1:** GIS was used to identify the acres of habitat for each modeled species and for critical habitat within each of the County-defined development zones (**Figure 4-1**). These zones were used in the Rural Development impact analysis. Rural Development constitutes a large proportion of the non-GIS covered activities, and the zones identified for rural development activities also reflect the general location of many other covered activities not tied to exact locations.
- **Step 2:** Acres of impacts for non-GIS covered activities were estimated within each development zone for each covered activity assessed (see **Table 4-5a through 4-5h**) by applying a weight factor that would result in a

higher or lower percentage of covered activities being attributed to one zone or another. For example, it is expected that most of the impacts associated with implementation of the conservation strategy will occur in the remote east hills and so a higher percentage of estimated impacts for those activities are attributed to the remote east zone than to the valley floor zone. Impacts were estimated by zone according to the general location of the activities.

- **Step 3:** Impacts by development zone were assumed to affect each species in proportion to the amount of the modeled habitat for that species found in that zone.

GIS was used to calculate approximately 63% of species-specific permanent impacts and approximately 60% of species-specific temporary impacts. GIS was used to calculate approximately 32% of critical habitat permanent impacts and approximately 74% of critical habitat temporary impacts. The remainder of the species and critical habitat impacts were developed based on assumptions non-GIS calculated impact distribution and habitat or critical habitat distribution.

## Effects on Habitat of Non-Modeled Species

### Plants without Models

Habitat models could not be developed for Tiburon paintbrush, Coyote ceanothus, and Santa Clara Valley dudleya because the microhabitat requirements of these species occur at a finer scale than the Plan mapping. For example, Santa Clara Valley dudleya occurs on serpentine rock outcrops, which often occur as scattered patches that are only several square feet in size. In addition, there are few known occurrences of most of these species in the study area (**Table 4-6**), except for Santa Clara Valley dudleya, making the model verification more difficult.

In the absence of models, estimates of temporary and permanent impacts to these species were based on impacts to the number of known occurrences that could be impacted by covered activities, as described above (**Table 4-6**). As a general guide and “worst-case” analysis of potential habitat, effects are also cited to land cover types that are broadly associated with each of these plant species.

## Effects on Plant Occurrences

In addition to the impacts to covered plant species habitat described above, it was important to examine as accurately as possible impacts to individual plant occurrences. The potential impacts to plant occurrences from covered activities, and the total allowed impacts to each species were determined by the following methods.

Potential direct effects on plant occurrences were analyzed based on occurrence data in the California Natural Diversity Database (CNDDB), records from SCVWD’s Biodiversity Monitoring Program, and data collected on the United Technologies Corporation property (T. Marker pers. comm.). Impacts were

assessed for covered activities for which GIS data were available. Covered activities with significant impacts (i.e., over 100 acres) for which specific location data are not known include rural development, County Parks capital improvement projects, and dam seismic safety retrofit borrow sites. In addition to the methods described here, impacts to specific plant occurrences from the SCVWD Dam Maintenance Program were provided by SCVWD. These were determined by site surveys during their EIR preparation and detailed analysis of the footprint of dam maintenance activities.

It is important to make a distinction between impacts that reduce the long-term viability of an occurrence and impacts that do not reduce the long-term viability of an occurrence. This analysis assumed that in most cases, occurrences that overlapped with the footprint of covered activities would result in complete loss of the occurrence. However, there will be some temporary or partial impacts to occurrences where the occurrence may recover in subsequent years and long-term viability is not affected. This possibility is discussed in Chapter 4, Section 4.4.1, subheading *Partial Permanent Impacts to Plant Occurrences* below and Condition 20 (Chapter 6). The “potential impacts” and “impact limits” defined and discussed in this section refer in all cases to the reduction of long-term viability of a covered plant occurrence.

For the purposes of this Plan, an occurrence of an annual plant species will be assumed to retain long-term viability and will not require replacement in the Reserve System if the decline in population size and percent cover from pre-project conditions is less than 25% over a monitoring period of at least 5 years (i.e., cumulative change over 5 years), unless site-specific conditions otherwise suggest substantial declines in population viability. The population size of annual covered plants may fluctuate more than 25% annually due to environmental variation such as rainfall. If extreme or unusual climate conditions affect the species, then monitoring will be extended 1 or 2 years, as appropriate to assess impacts and success (see Condition 20, Chapter 6).

An occurrence of a perennial plant species will be assumed to retain long-term viability and will not require replacement in the Reserve System if the decline in seedling recruitment and density from pre-project conditions is less than 25% over a monitoring period of at least 3 years, unless site-specific conditions otherwise suggest substantial declines in population viability (see description of Condition 20 in Chapter 6).

Specifically, potential impacts were assessed by first creating a GIS overlay of the location of covered activities (i.e., the planning limit of urban growth and covered capital projects illustrated in **Figure 2-6** and **Figure 2-7**) with the plant occurrence data for all covered plant species. Next, this data and CNDDDB occurrence data, were used to determine which occurrences of each species would be impacted by each activity. Finally, total potential impact numbers were determined. The results of this analysis are summarized in **Table 4-6** and discussed for each species in more detail later in this chapter. The impact limits in this table will be tracked during implementation to ensure permit compliance.

After the total potential impacts were calculated, actual impact limits were determined for each species. The impact limit was determined based on a number of factors, including (but not limited to) the overall species range and distribution, number of known occurrences, recent frequency with which new populations have been discovered, and rarity status.

In this section, impacts are discussed in terms of numbers and percentages of occurrences as well as estimates of absolute numbers of individuals where such estimates are feasible (impacts on modeled habitat is discussed in Section 4.6.8 *Serpentine Plants* and 4.6.9 *Non-Serpentine Plants* below). For annual plant species, discussion of absolute numbers is difficult as the populations can fluctuate widely from year to year due to environmental variation (e.g., rainfall). Some occurrences in the CNDDDB include estimates of numbers of individuals, however, many occurrences do not or the estimates are from only one year. Additionally, in the rare cases where there are multiple years' data, these numbers often vary widely (e.g., from hundreds in one year to thousands in another for just one occurrence).

As shown in **Table 4-6**, the Plan does not allow for the reduction of long-term viability of Tiburon Indian paintbrush and Coyote ceanothus. For more details on these impacts, including a discussion of permanent and temporary impacts to modeled habitat, see the discussion on each species later in this chapter.

It is expected that new occurrences of many of the covered plants will be discovered both within the impact areas and the Reserve System. In many cases, it is warranted to allow additional impacts to covered plants beyond the occurrences known at this time. Limits on take of some covered plant species can be increased up to the limit shown in the final column of **Table 4-6**. **Table 5-16** identifies the total number of occurrences in the study area<sup>12</sup> and the number of new occurrences that must be protected in the Reserve System before these additional impacts can occur. The species selected for additional limits and the limits set were determined based on two criteria.

- Future survey efforts in the permit area are likely to reveal that there are more occurrences of the species than are currently known.
- There are more occurrences known in the study area at the time of permit issuance than the Recovery Plan de-listing criteria or, for non-listed species, more than the long-term conservation criteria (U.S. Fish and Wildlife Service 1998)<sup>13</sup>. For species without de-listing or long-term conservation criteria, there must be more than 20 occurrences throughout the species' range.

Based on these criteria, all covered plants except three qualify for an increase in allowable impacts during Plan implementation if additional occurrences are found and protected. No additional impacts to Coyote ceanothus, Tiburon Indian

<sup>12</sup> Plant occurrences in the expanded burrowing owl study area do not count toward the baseline necessary before additional impacts may occur.

<sup>13</sup> Santa Clara Valley dudleya de-listing criteria is 30 populations. Species with long-term conservation criteria are Mount Hamilton thistle (23 populations), smooth lessingia (10 populations), and most beautiful jewelflower (22 populations).

paintbrush, or Metcalf Canyon jewelflower are allowed under the Plan even if additional occurrences are found.

As with all other impacts to covered plant occurrences, new occurrences of the species must be protected in the Reserve System before the impacts occur and the protected occurrences must be in as good or better condition than the new occurrences impacted by covered activities (“condition” is defined in Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Actions*). See Chapter 5 for protection requirements to allow additional take limits in **Table 4-6**. Created occurrences will not count toward this Stay-Ahead provision for plants due to the highly experimental nature of creation. For the purposes of this Plan, created plant occurrences will not be used to mitigate adverse effects but rather to contribute to the recovery. The only exception to this rule is Coyote ceanothus. Because it may not be possible to protect one occurrence of Coyote ceanothus in the timeline described in Section 5.4.11, a created occurrence may serve as a portion of the mitigation for this species (see Chapter 5, Section 5.4.11 *Coyote Ceanothus* for details).

## Partial Permanent Impacts to Plant Occurrences

Certain covered activities could have permanent impacts to a portion of plant occurrences through construction, occasional operations and maintenance, and other short-term activities. If impacts resulting from covered activities do not reduce the long-term viability of the plant occurrence as described in Chapter 6, Section 6.6.2, subheading *Condition 20 Avoid and Minimize Impacts to Covered Plant Occurrences*, then it will be considered a partial impact on the occurrence and will not count toward the impact limits in **Table 4-6**. If the impacts do result in reduction of long-term viability of the occurrence, then it would be considered a permanent impact, and the impacts to the occurrence would count toward the maximum number of impacts to that species allowed under the Plan. For the purposes of this Plan, an “impact” to a plant occurrence results from the removal of an occurrence or the reduction of long-term viability of an occurrence (as defined in Chapter 6, Section 6.6.2, subheading *Condition 20 Avoid and Minimize Impacts to Covered Plant Occurrences*). Conditions on covered activities minimize the effects of covered activities on covered plants, and include monitoring actions and success criteria to determine the effects on long-term viability (see Chapter 6, Section 6.6.2, subheadings *Conditions 19 Plant Salvage when Impacts are Unavoidable* and *Condition 20 Avoid and Minimize Impacts to Covered Plant Occurrences*).

### 4.4.2 Indirect Effects

Unlike direct impacts, which are estimated quantitatively, indirect impacts are assessed qualitatively except for nitrogen deposition and watershed impervious surfaces for which quantitative analyses were run. In most cases the indirect impacts on species are summarized in **Table 4-1** and discussed in narrative form in the results sections below. As discussed above, estimates of direct effects on



land cover types have been quantified conservatively (i.e., somewhat overestimated). These conservative estimates are intended, in part, to incorporate many of the indirect effects of the covered activities listed in **Table 4-1** and ensure that the conservation strategy provides enough conservation to offset these indirect impacts.

## Impervious Surfaces

Impervious surfaces are materials of natural or anthropogenic sources that prevent the infiltration of water into soil. Impervious surfaces can affect the flow, sedimentation load, and pollution composition of stormwater runoff. An increase in impervious surfaces on a landscape is directly related to increases in human activity through the development of structures and infrastructure such as buildings, streets, sidewalks, and parking lots.

Classification of watersheds and subwatersheds by the amount of impervious cover is an important component of developing land use and habitat planning goals. Although presence of riparian vegetation and wetlands can mitigate the impacts of impervious cover, a watershed with high impervious cover is generally not able to support a high-quality stream system. A strong negative relationship between biotic integrity, land use, and riparian conditions begins to occur at approximately 10% imperviousness. Stream degradation occurs at relatively low levels of imperviousness (10–20%) (Chester and Gibbons 1996).

According to the Center for Watershed Protection (2003), an initial guide to evaluating urban/suburban stream quality is: (1) sensitive streams (0–10% imperviousness) typically have good water quality, good habitat structure, and diverse biological communities if other stresses are absent; (2) impacted streams (10–25% imperviousness) show clear signs of degradation; (3) non-supporting streams (>25% imperviousness) have a highly unstable flow and poor biological condition.

The Plan includes an analysis of the expected increase in impervious surfaces due to urban development and other covered activities. This analysis provides an indication of the magnitude of change of impervious surfaces in the watershed and therefore how covered aquatic species and other native aquatic species might be affected.

For the purposes of the Plan, the important metric is the change in impermeability between existing conditions and conditions in the study area at the conclusion of Plan implementation. To assess this change, the quantity of impervious surface in each of the study area's major watersheds was calculated, both upstream and downstream of reservoirs, using the existing land cover classification developed for the Plan (**Figure 3-10**). An impervious surface assumption for each land cover was derived (**Table 4-7**) from the Center for Watershed Protection research (Cappiella and Brown 2001), based on impervious cover classifications from eight geographic locations in the United States. That group's research has shown that the amount of impervious cover on a developed parcel is generally very similar for a particular zoning category no matter where

it is located. The literature also notes there are no nationally applicable or standard coefficients that account for the variability in forest, shrub, and herbaceous cover and turf cover coefficients.

## Method for Calculating Impervious Surface

The calculation used for determining impervious surface cover is shown below.

$$ALC * IC = AIC$$

where:

**ALC** = acres of land cover

**IC** = impervious assumption for each land cover

**AIC** = impervious area in acres

This equation was first applied to existing land covers to calculate the current impervious surfaces (in acres) for each subwatershed (Coyote, Guadalupe, Llagas, Uvas, and Pacheco). **Figure 4-2** shows the watersheds assessed in this analysis. To account for interim projects (those projects entitled for development in advance of Plan implementation), it was assumed that interim projects located inside the planning limit of urban growth would be developed to the urban-suburban land cover type and that interim projects located outside the planning limit of urban growth would be developed to the equivalent of the rural-residential land cover. These assumptions are reflected in the existing conditions of the impervious surface analysis.

The results of the impact analysis described in Section 4.4.1 *Direct Effects* were used to identify the acres of each type of land cover anticipated to exist at the conclusion of Plan implementation. To do this, each covered activity analyzed for the impact analysis was assigned a new land cover type that is assumed to be present after covered activity implementation. The majority of impacts are associated with urban or rural residential development. For these two covered activities, all impacted areas inside of the planning limit of urban growth were assumed to become the Urban-Suburban land cover type, and all areas impacted by rural development were assumed to become the Rural Residential land cover type. Land cover type conversions were assigned to the remainder of covered activities based on the assumed land cover type present after covered activity implementation.

Next, covered activities were assigned to watersheds where they are assumed to be implemented. As described above, the impact analysis required both GIS analyses and use of assumptions to describe the activity and estimate impacts (see **Tables 4-5a through 4-5f** for details). For those activities mapped in GIS, location by watershed and land cover type assumed for post-implementation were calculated using GIS. For those activities where the exact location of the activity is not known in GIS, assumptions were developed to assign the activity to a watershed.

Once land cover types by watershed for post-covered activity implementation were established, the above equation was again applied to calculate the amount of impervious acres within each subwatershed. The results are shown in **Table 4-8**.

There are several other partial watersheds in the study area (i.e., Alameda, Calabazas, South Santa Clara Valley, San Thomas, Santa Cruz Mountains, and Watsonville watersheds) that were not included in this analysis. As a result, approximately 23,000 acres of the study area were excluded. In addition, because covered activities were either assessed in GIS or were distributed to watershed according to assumptions on where the covered activity would occur, not all impacts were assessed through this analysis as they either will or are assumed to occur in non-assessed watersheds. This may result in a small underestimation of changes in study area imperviousness.

## Nitrogen Deposition

Indirect impacts of increased nitrogen deposition on natural communities and covered species are anticipated to result from urban development and rural development covered under the Plan. These covered activities would result in increased air pollutant emissions from passenger and commercial vehicles and other industrial and nonindustrial sources. Emissions from these sources are known to increase airborne nitrogen, of which a certain amount is converted into forms that can fall to earth as depositional nitrogen. It has been shown that increased nitrogen in serpentine soils can favor the growth of nonnative annual grasses over native serpentine species (Weiss 1999). These nonnative species, if left unmanaged, can overtake the native serpentine species, including dwarf plantain (*Plantago erecta*), the host plant for larval Bay checkerspot butterfly. Nonnative plants may also compete with native plants for water, nutrients, light, and sites for germination, crowding out covered plants (e.g., Metcalf Canyon jewelflower, most beautiful jewelflower, and fragrant fritillary). California grasslands are believed to be among the most sensitive to nitrogen deposition (Fenn et al. 2010). Coyote ceanothus may also be affected by competition with nonnative species, but because this covered species is a woody plant, the effects of such competition are likely to be less severe than the effects on native herbaceous species. To assess the degree to which nitrogen deposition will increase as a result of Plan implementation, a nitrogen deposition study was conducted (see **Appendix E**).

## Summary of Methods

Nitrogen deposition was analyzed using several modeling approaches in order to estimate the sources that contribute to deposition in the study area. In order to estimate contributions from individual roadways and to assess the increase in deposition due to increases in traffic, Gaussian models for a limited domain were applied to receptors centered on serpentine habitat that supports populations of the threatened Bay checkerspot butterfly. Modeling with Gaussian models, while

not providing an estimate of overall deposition, provides an estimate of deposition from individual roadways and the expected increases in deposition from those roadways in the future. The much more complex Community Multiscale Air Quality modeling system (CMAQ) was also used to simulate the study area's more complex nitrogen transport processes, and, using the Particle and Precursor Tagging Methodology source apportionment technique, to estimate contributors to deposition on a broader scale. Modeling with CMAQ also provides estimates of expected increases in deposition in future years.

## 4.5 Effects on Natural Communities/Land Cover

### 4.5.1 Direct Effects

Temporary and permanent impacts of each covered activity on each land cover type are summarized in **Tables 4-2 and 4-3**.

In most cases the data provided and assumptions made were reasonable worst-case assumptions of future project impacts. The actual impacts of specific projects over the permit term of 50 years may vary from the assumptions described in **Tables 4-5a–h** and total impacts will likely be less than the maximum allowable impacts in **Tables 4-2 and 4-3**.

In-stream impacts calculated for projects without exact footprints distribute all impacts across riparian land covers in proportion to the land cover type's occurrence in the study area. This approach may overestimate actual impacts because riparian land cover may not be present everywhere a project is conducted, particularly in urban areas. Moreover, actual in-stream impacts may be somewhat lower than those calculated because of flexibility in implementing avoidance measures (e.g., building clear-span bridges to avoid streams, building in sites where no riparian vegetation exists).

Stream impacts may be overestimated because miles of impact were calculated on the basis of project footprints. Some capital projects, such as flood-control projects that do not include concrete or riprap, will be able to avoid or minimize impacts on streams.

Estimated impacts on rare or sensitive land cover types do not account for project-by-project avoidance that will be applied to comply with the conditions detailed in Chapter 6 or other regulations such as CEQA. For example, recreational facilities such as buildings, outhouses, trails, and trailhead facilities, can usually be sited away from sensitive land covers. Consequently, impacts on serpentine grassland, serpentine chaparral, valley oak woodland, and knobcone pine woodland may be overestimated. While the areal extent of the impact footprint of these projects may not change, judicious siting may reduce the impacts on sensitive land cover types.

## 4.5.2 Indirect Effects

### Impervious Surfaces Analysis Conclusions

The results are shown in **Table 4-8**. Through comparison of existing and future watershed imperviousness, it is possible to estimate the level of impact on watershed health that implementation of covered activities may have on each subwatershed, as measured by imperviousness.

This imperviousness analysis does not take into account any stormwater management activities that would decrease run-off in the study area (e.g., cisterns or retention ponds). These types of requirements are currently integrated into the San Francisco Bay Regional Board NPDES permits and will be incorporated into new Central Coast Regional Board NPDES permits in the future. As such, this analysis may overestimate the increase in run-off into local streams that may degrade water quality. See Chapter 6, Section 6.4.1, subheading *Condition 3 Maintain Hydrologic Conditions and Protect Water Quality* for more details on stormwater management in the study area.

### Nitrogen Deposition Analysis Conclusions

Indirect impacts of continued nitrogen deposition on natural communities are anticipated to result from urban development and rural development covered under the Plan. Serpentine land cover types are the focus of preservation and enhancement actions to offset the effects of nitrogen deposition (among other impacts). However, several other land cover types in the study area have been identified as sensitive or potentially sensitive to nitrogen deposition (Weiss 2006): Northern mixed and serpentine chaparral, mixed oak woodland, foothill pine-oak woodland, mixed evergreen forest, and redwood forest are known to be sensitive to nitrogen deposition. According to this report, California annual grassland, valley oak woodland, blue oak woodland, coast live oak forest and woodland, freshwater marsh, seasonal wetland, and pond may be sensitive to nitrogen deposition.

### Baseline Deposition

Emissions for the base year Gaussian modeling were based on traffic counts for highways and roads in 2005. For CMAQ modeling, base year emissions were acquired from the Bay Area Air Quality Management District (BAAQMD). Estimates of baseline deposition based on observations of nitrogen dioxide (NO<sub>2</sub>) concentration and modeling using CMAQ both give estimates of total nitrogen deposition of about 6 kg-N/ha/y, which is consistent with other studies such as Weiss (2006).

## Changes in Nitrogen Deposition during the Permit Term

Reliable future year emissions were not available when the CMAQ modeling was conducted. As such, future year emissions were extrapolated from the base year based on population growth. Using this assumption, contribution of mobile source emissions in the habitat area are estimated to increase by about 0.6 kg-N/ha/y in 2035 over the base year and by another 0.5 kg-N/ha/y in 2060. The San José contribution to nitrogen deposition in the habitat areas is estimated to be 38% in 2035. Gaussian modeling of major roadways near the habitats indicates an increase in nitrogen deposition of about 0.25 kg-N/ha/y in 2030 over the base year (a 4% increase in total deposition). The increase in 2060 relative to 2030 could be from 0.4 kg-N/ha/y to more than 1 kg-N/ha/y (at the Hale Avenue site) depending on location (a 7% to 17% increase in total deposition).

Based on the CMAQ modeling, should increases in NO<sub>x</sub> emissions occur in proportion to growth within the study area, within Santa Clara, and within the region, total average nitrogen deposition in the area around and including the habitat areas could increase to 8 kg-N/ha/y in 2035 (a 33% increase) and almost 10 kg-N/ha/y in 2060 (a 66% increase). Gaussian modeling indicates that, when emissions are extrapolated based on projected growth, contributions to nitrogen deposition from major roadways could increase by almost a factor of two by 2030 and by an even larger amount by 2060.

As described above, the modeling shows that increases in NO<sub>x</sub> emissions result in increased nitrogen deposition. As such, it may be fair to assume a similar correlation between a reduction in NO<sub>x</sub> emissions and a reduction in nitrogen deposition. In 2011 the BAAQMD released future year projections through 2025. These projections show a decrease in NO<sub>x</sub> emissions from approximately 449 tons/day in 2008 to 360 tons/day in 2025 (a reduction of 89 tons/day). There appears to be a slight increase in NO<sub>x</sub> emissions between years 2022 and 2025. These new projections indicate that the future year nitrogen deposition rates extrapolated in this analysis are over-estimated and suggest that there may be a decrease in current rates of nitrogen deposition. However, NO<sub>x</sub> emissions, and therefore nitrogen deposition, are not expected to cease entirely. In addition, emissions containing other nitrogen compounds (e.g., NH<sub>3</sub> [ammonia]) may also contribute to nitrogen deposition. As cited in Fenn et al. (2010), a recent study shows that 25% of the nitrogen emissions from light duty vehicles in three California cities are in the form of NH<sub>3</sub>, and in newer cars the proportion is greater (Bishop et al. 2010 as cited in Fenn et al. 2010). The BAAQMD (2010) reports 52 tons/day of ammonia emissions in the Bay Area as of 2008. Leading sources of ammonia emissions include landfills, wastewater treatment, and refineries (19.8%); light-duty motor vehicles (17.4%); livestock (15.5%); commercial refrigeration (wineries, breweries, and cold storage warehouses; 15.4%); human respiration and perspiration (13.8%); and domestic animal waste (9.0%).

Fenn et al. (2010) report a critical load (the load at which undesirable effects are observed) for California serpentine grasslands of 6 kg-N/ha/y. This load is equal to the current estimates for nitrogen deposition rates in the study area (see *Baseline Deposition* above). While this rate may be expected to drop based on

the BAAQMD report of reduced NO<sub>x</sub> emissions, it is uncertain how the reduction will be offset by increases in other nitrogen sources, or what level of reduction would be required to reverse the current adverse effects of nitrogen deposition. Additionally, studies from grasslands in other regions of North America have shown that significant impacts to biodiversity in grassland communities can occur from the accumulation of even low levels of nitrogen deposition (Fenn et al. 2010).

## Contributors to Deposition

The amount that various sources contribute to deposition was assessed with different modeling approaches. The most complete of these methods was the use of the PPTM tagging approach in CMAQ. In the base year, the CMAQ PPTM simulation attributes 30% of the total nitrogen deposition to mobile sources within the study area. Another 16% of the nitrogen deposition comes from stationary sources in the study area. Therefore, 46% of nitrogen deposition on the habitat areas comes from existing development and vehicle traffic generated locally within the study area. The remainder of Santa Clara County contributes 17% of the nitrogen deposition while the remaining Bay Area counties account for about 11% of the deposition. The CMAQ simulation indicates that the remaining 26% of the N-deposition comes from anthropogenic emissions in the remainder of the modeling domain (i.e., most of the remainder of California other than Bay Area counties and a portion of Nevada), initial and boundary concentrations (i.e., effects from outside of the modeling domain), and biogenic emissions within the Bay Area counties.

Impacts of nitrogen deposition from Morgan Hill and Gilroy were not explicitly identified in the modeling, but are part of the contribution referred to as the remainder of Santa Clara County. In the emissions inventory used to prepare emissions for CMAQ, municipalities are not identified separately from the county in which they are located. Estimates of emissions for Morgan Hill and Gilroy were made based on the overlap of boundaries of these cities with grid cells in the modeling domain. Based on these estimates, Gilroy contributes 2% of the Santa Clara County NO<sub>x</sub> emissions, Morgan Hill contributes 3%, San José contributes 79%, and the remainder of Santa Clara County contributes the remainder of the NO<sub>x</sub> emissions (16%). It is reasonable to assume that the impacts from Gilroy and Morgan Hill would be roughly in proportion to their emissions. Of the 17% contribution to nitrogen deposition noted for the remainder of Santa Clara County, therefore, we could expect Gilroy to make up about 1.5% (9% of 17%) and Morgan Hill to make up about 2.7% (16% of 17%).

The contribution of emissions outside of the study area but within Santa Clara County are estimated to grow from 1.1 kg-N/ha/y in the base year to 1.5 kg-N/ha/y in 2035 and 1.7 kg-N/ha/y in 2060. The contribution of emissions from all other Bay Area counties are estimated to grow from 0.7 kg-N/ha/y in the base year to 0.9 kg-N/ha/y in 2035 and 1.0 kg-N/ha/y in 2060.

See **Appendix E** for the complete nitrogen deposition analysis.

## 4.6 Effects on Covered Species

This section describes the potential direct and indirect effects on covered species under the Plan. The amount of incidental take of covered species has been estimated in accordance with the methods described in Section 4.4 *Impact Assessment Methods*. Estimates of incidental take are based on the habitat models developed for 16 of the 19 covered species. These estimates are likely to be inflated for two reasons: habitat models may overestimate the actual extent of suitable habitat (see species profiles in **Appendix D** for details on each model); and suitable habitat may not be occupied by the subject species. For three of the covered species, sufficient information was not available to create geographically explicit (i.e., GIS-based) habitat models. In these cases, worst-case assumptions were used regarding the amount of suitable habitat removed by covered activities.

The major direct impacts on most covered species will result from habitat loss associated with urban and rural development. For wildlife species, the determination of direct and indirect effects on covered species is based on the habitat disturbed for each species. For covered plants, effects are determined both in terms of habitat and effects on known occurrences. **Tables 3-5 and 3-6** and the species accounts (**Appendix D**) provide additional information on specific biological needs for each covered species, including the links between species life-history needs and land cover types used in the analysis. Impacts are described below for groups of species that are subject to similar impact mechanisms. Maximum allowable impacts on covered species for which habitat models have been developed are provided in **Table 4-4**. Maximum allowable permanent and temporary impacts to land cover types and natural communities are provided in **Table 4-2** and **Table 4-3** respectively. Maximum allowable permanent impacts to plant occurrences are provided in **Table 4-6**. Compliance monitoring will document species habitat and plant occurrence impact limits, as well as land cover type and natural community impact limits. Therefore, there will be some overlap in impact accounting (e.g., 1 acre of impact may count both against the serpentine grassland cap and the Bay checkerspot butterfly habitat impact cap).

Descriptions providing additional specificity on the type and location of covered activities anticipated to impact each species are provided; however, these descriptions do not preclude other covered activities from impacting the covered species in different locations. As long as the activity is covered under the Plan, impacts to each covered species are permitted up to the maximum allowable impacts provided in **Table 4-4** and **Table 4-6**.

As discussed in Chapter 1, California State Parks lands are excluded from the permit area. Because of this exclusion, all of the land cover-related analyses in the Plan are based on the study area less State Parks lands unless otherwise noted. The size of the study area less State Parks lands is 460,205 acres. All percentages of impacts discussed below were calculated relative to the 460,205 acre permit area excluding State Parks.



## 4.6.1 Bay Checkerspot Butterfly

Bay checkerspot butterfly populations within the study area have been studied for many years and are relatively well understood. Serpentine grassland on both sides of the Santa Clara Valley provide habitat for this species. The population along Coyote Ridge, by far the largest in size and area, is critical to the persistence of the species. Because the only extant populations occur within the study area, maintaining and managing serpentine grassland habitats is important for the continued existence of this species.

Bay checkerspot butterfly habitat units are divided into two broad categories: core and satellite. The definitions for core and satellite habitat units are adapted from the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). Core habitat units are “moderate to large areas of suitable habitat that support persistent Bay checkerspot populations.” Satellite habitat units are “generally smaller and contain less high-quality habitat than core areas, and may occur some distance from core areas.” The status of the core and satellite habitat units is identified as occupied, potential, historic, or unknown. For habitat units defined as “occupied,” species is known to occupy the patch at least in some years. Where individuals were present historically, but now the site is unoccupied and likely no longer suitable, the habitat unit is defined as “historic.” If the site has not been surveyed thoroughly or surveyed in the last ten years, habitat unit was classified as “unknown.” Otherwise suitable patches of serpentine grassland within the dispersal distance of known populations were considered “potential” habitat units if land use management practices such as livestock grazing could improve conditions for the species.

## Direct Effects

Most, but not all, serpentine bunchgrass grassland is considered species habitat (see **Appendix D**, *Modeled Habitat Distribution in Study Area*). As such, most covered activities that remove or alter serpentine grassland habitats are potentially detrimental to this species. Expansion of urban areas or rural residential development is most likely to result in the majority of impacts on this species. For example, suburban and rural residential development could remove suitable habitat—and possibly individuals—along Coyote Ridge and in the Santa Cruz Mountains. In addition, changes in land use or management of serpentine grasslands could also adversely affect the Bay checkerspot butterfly. Changes in land use that are often associated with expansion of urban areas or rural residential development could also be detrimental to the long-term viability of these populations.

A permanent impacts cap of 550 acres is applied to impacts to the serpentine bunchgrass land cover type (**Table 4-2**), the key habitat land cover type for Bay checkerspot butterfly. An additional 91 acres of temporary impacts to serpentine bunchgrass grassland is anticipated and is the maximum impact allowed (**Table 4-3**). Up to 300 acres of permanent impacts and 54 acres of temporary

impacts to Bay checkerspot butterfly modeled habitat mapped (see **Appendix D** and **Table 5-7**) as “occupied” or “potential” are authorized under this Plan (**Table 4-4**), all of which is also serpentine bunchgrass grassland<sup>14</sup>. Impacts to modeled habitat mapped as “historic/unoccupied” and “occupancy unknown” are not subject to this cap because these units:

- are either no longer occupied and have little or no chance of occupancy in the future due to habitat degradation and fragmentation (“historic/unoccupied” units);
- are very small and far from core habitat units and therefore would, at best, support very small populations in only some years (Communications Hill 2 and Valley Christian High School); or
- are surrounded by urban or urbanizing development and are expected to decline in suitability or be lost as covered activities are implemented (Communications Hill 1 and 2, San Martin/Hayes Valley, Southwest Anderson Reservoir, and Valley Christian High School).

Impacts to Bay checkerspot butterfly habitat is further limited to 3% of the unprotected portion (everything except Type 1 open space) of any core or satellite habitat unit targeted for conservation<sup>15</sup> (as defined in **Table 5-7**), with one exception. The exception is the Kirby/East Hills core habitat unit which has an 11% allowance to accommodate the Kirby Landfill expansion of 80 acres. See Chapter 6, Section 6.5, subheading *Condition 13 Serpentine Avoidance and Minimization* for details on serpentine avoidance requirements applied to covered activities.

Impacts are predicted to occur in 12 of the 22 habitat units of Bay checkerspot butterfly in the study area, which constitutes the known range of the species to date. These impacts are distributed across core occupied habitat (**Table 5-7**), satellite occupied habitat, satellite potential habitat, satellite habitat with occupancy unknown, and satellite habitat with historic occurrences. Impacts to critical habitat are detailed in Section 4.7 *Effects on Critical Habitat* below.

A discussion of population trends and key features of the population dynamics of the Bay checkerspot butterfly is presented in **Appendix D**. In **Appendix D**, population estimates for most of Coyote Ridge are presented. Based on this data, the most important core habitats are topographically diverse areas near the ridge top. The higher elevation ridge top and adjacent north slopes and canyons have favorable combinations of high topographic diversity, including large expanses of north-facing slopes, and the coolest and wettest parts of Bay checkerspot butterfly habitat.

The conservation strategy for the Bay checkerspot butterfly includes the acquisition, in fee title or conservation easement, and management of a

<sup>14</sup> The maximum allowable impact to serpentine bunchgrass grassland that is also Bay checkerspot butterfly habitat is 300 acres, leaving 250 acres of allowable impact to serpentine bunchgrass grassland that is not Bay checkerspot butterfly habitat.

<sup>15</sup> These caps do not apply to habitat units in Type 1 open space because loss of habitat will be extremely limited in permanently protected open space (i.e., limited to trail construction and management activities).

substantial portion of the core habitats on Coyote Ridge and the Silver Creek Hills (see Chapter 5, Section 5.4.1 *Bay Checkerspot Butterfly* for details). This acquisition will include most of the core habitat along the ridge tops, which provides high quality habitat for Bay checkerspot butterfly and have historically (since 1984) supported the densest populations of Bay checkerspot butterfly (see **Appendix D**). The lower elevation areas are warmer and drier, and slopes tend to be south and west-facing, with small areas of north-facing slopes in canyons. As a result, these areas have been occupied by far lower densities of Bay checkerspot butterfly than on the ridge top.

All impacts to Bay checkerspot butterfly core and satellite habitat units are expected to be small except for the Kirby Landfill site, as discussed above, and the Pound Site. The proposed development on the Pound Site, approximately 27 acres to accommodate the Mariposa Lodge/Sheriff's Firing Range project, would occur in lower quality habitat in and near developed sites and on dry, south-facing slopes. The ridge tops in this unit support some of the highest quality habitat for Bay checkerspot butterfly and will be avoided for the reasons stated above. Impacts of individual covered activities in core or satellite habitat units are expected to be small (less than 10–20 acres each) because of the limitations on land use development in the County and San José (the two jurisdictions where this habitat occurs) and the requirement to minimize impacts to serpentine bunchgrass grassland (Chapter 6, Section 6.5, subheading *Condition 13 Serpentine and Associated Covered Species Avoidance and Minimization*).

The Kirby Landfill expansion will remove up to 80 acres (11%) of currently unprotected habitat for this species in the Kirby/East Hills core habitat unit. The areas lost to the landfill are primarily south and west-facing slopes, with pockets of north-facing slopes in the canyon. The crests of the north-facing slopes of the developed area have been patchily occupied by Bay checkerspot butterfly, but densities were much lower (100–300 larvae/ha) in 2001 than those along the ridge top (3,000–10,000+/ha) in the 267-acre Butterfly Trust Reserve, which encompasses some of the best quality habitat on Coyote Ridge (S. Weiss pers. comm.). The loss of these 80 acres represents far less than 11% of the prime Bay checkerspot butterfly habitat in the Kirby/East Hills habitat unit. Loss of this habitat is not expected to affect the persistence of the population in this area because it is of relatively low quality and the extent of habitat acquisition and management that will be accomplished through this Plan. Approximately 44% of this unit is already permanently protected.

Impacts to historic/unoccupied Bay checkerspot butterfly habitat units are expected at Communications Hill. Communications Hill 1 and Communications Hill 2 support 230 acres and 25 acres of marginal habitat for the species respectively, all of which is expected to be lost as a result of urban development at that site and habitat fragmentation. Although the species was present at this site historically, it is no longer there due to the site's isolation from core areas and the loss and fragmentation of habitat to date. As previously indicated, loss of serpentine bunchgrass grassland at these two historic/unoccupied habitat units will not count toward the Plan's 300-acre modeled primary habitat impact cap for Bay checkerspot butterfly; however, these impacts will count toward the Plan's 550 acre serpentine bunchgrass grassland impact cap.

The conservation actions for serpentine grassland and serpentine covered species are discussed in detail in Chapter 5. Several aspects of this conservation strategy are relevant to the impacts of nitrogen deposition described below, because these strategies will influence the ways in which excess nitrogen affects covered species. All serpentine grassland incorporated into the Reserve System (both new lands and existing protected areas) will employ proven management techniques such as livestock grazing and prescribed burning. Both techniques can remove excess nitrogen from the community and reduce relative cover of nonnative grasses, maintaining populations of native plants such as dwarf plantain, one of the host plants for Bay checkerspot butterfly, and other serpentine plants (Weiss 2006). Appropriate grazing in some serpentine grasslands, such as Coyote Ridge, has been successful at maintaining high-quality Bay checkerspot butterfly habitat despite elevated nitrogen deposition levels (Santa Clara Valley Transportation Authority 2006). Accordingly, it is expected that management techniques can be used in the future to substantially reduce the adverse effects of increased nitrogen deposition on serpentine grassland communities and thus on Bay checkerspot butterfly and covered serpentine plants.

The most significant threat to the Bay checkerspot butterfly continues to be nitrogen deposition and lack of management to minimize the effects of nitrogen deposition. Key management techniques include livestock grazing, mowing with string cutters, hand-pulling, prescribed fire, and spot applications of herbicide. The ability to conduct long term grazing is central to habitat management. All of these conservation actions are important to maintain and improve Bay checkerspot butterfly habitat but some may have short-term adverse effects. Mowing, hand pulling, and prescribed fire all occur after the Bay checkerspot butterfly has entered diapause in deep soil cracks and under rocks (May–June). Proper use of prescribed fire will have minimal direct negative impacts on Bay checkerspot butterfly populations. Similarly, proper and limited use of herbicide will have minimal direct negative effects on the species. For example, herbicide applications using a graminicide “Envoy” have proven highly effective and are limited to high priority infestations immediately along roads and cover less than 10 acres in any given year.

Recreational trail access creates local disturbance from trail construction, foot traffic, maintenance, and occasional off-trail use. Most likely trail routes will follow existing roads. Additional well designed and maintained trails that will be constructed in the Reserve System will pose minimal threats to healthy Bay checkerspot butterfly populations, even in the smaller satellite populations such as Tulare Hill. Direct effects associated with recreation will be minimized with the implementation of conditions on recreation (see Chapter 6, Section 6.4.6, subheading *Condition 9 Prepare and Implement a Recreation Plan*).

The diversity of serpentine grassland depends on disturbance from many sources, including gophers, cattle, surface erosion, and landslides. The existing grazing regimes provide far more extensive disturbance on an ongoing basis than do the existing or proposed management and recreational uses, and the size and diversity of Coyote Ridge can readily absorb these impacts. Localized

disturbances are usually rapidly recolonized by diverse native plants, including Bay checkerspot butterfly host and nectar plants.

## Indirect Effects

Indirect effects to Bay checkerspot butterfly are expected to result from increased vehicular use (i.e., nitrogen emission deposition, vehicular strikes), increased emissions and deposition from stationary sources of nitrogen, conservation strategy implementation, and other covered activities. Each of these categories of indirect effects is discussed below.

### Nitrogen Deposition

Covered activities that facilitate increased vehicular use or electricity generation in the study area will contribute to on-going nitrogen deposition on Bay checkerspot habitat, especially on Coyote Ridge. The effects of different nitrogen sources were modeled for the study area and the region (see Section 4.4.2 *Direct Effects* subheading *Nitrogen Deposition*, and **Appendix E** for details). New major point sources of nitrogen deposition that could adversely affect serpentine communities and associated covered species could not be adequately analyzed at this time (e.g., new power plant, large diesel generator, or other facilities). To address this, the Wildlife Agencies will have additional review and approval authority over new major point sources of nitrogen that could adversely affect serpentine natural communities and associated covered species (see Chapter 8, Section 8.7.3 *Wildlife Agency Responsibilities*). Nitrogen deposition (N-deposition) in Bay checkerspot butterfly habitat comes from a mix of the regional plume from all upwind sources, including emissions and deposition from stationary sources, and local plumes from road traffic, primarily along U.S. 101. The deposition from any one road is small relative to the regional plume except on habitat within 660–990 feet (200–300 meters), and is primarily the effects of vehicular  $\text{NH}_3$  and  $\text{NO}_2$  emissions (CH2M Hill 2004). Large point sources (i.e., stationary sources) like the Metcalf Energy Center also have small incremental effects. Regional mobile and area sources that are closer to the Bay checkerspot butterfly habitat have larger effects than those from more distant counties; Santa Clara County sources within the study area are estimated to provide 63% of the current deposition (**Appendix E**).

Nitrogen deposition levels are high enough across the study area that all serpentine grassland is at risk, but some areas have higher loads than others. The “critical load” for N-deposition in serpentine grassland, where nonnative grasses have difficulty invading completely, is 5–6 kg-N/ha/yr, as measured with passive samplers (CH2M Hill 2004; Fenn et al. 2010). Tulare Hill and the lower slopes of Coyote Ridge, near U.S. 101, have the highest deposition (15–20 kg-N/ha/yr), and the ridge top above Kirby Canyon receives 10–15 kg-N/ha/year. The reduced N-deposition at the ridge top is a function of its distance from immediate sources (U.S. 101) and its position above the inversion layer on many mornings. In contrast, deposition at Jasper Ridge and at Edgewood County Park (both in

San Mateo County) 1,300 feet from U.S. 280 are 4–5 kg-N/ha/yr. Impacts to Bay checkerspot butterfly habitat resulting from development are most likely to occur at the bottom of slopes, where nitrogen deposition is highest (and therefore habitat quality is lowest).

On-going nitrogen deposition will continue to give nonnative species the ability to dominate native serpentine grasslands, systematically supplanting suitable habitat for covered serpentine plant species and for Bay checkerspot butterfly. It is not possible to precisely determine the nature of the effects of on-going nitrogen deposition on serpentine grassland. While it is likely that on-going nitrogen deposition will favor the growth of nonnative annual grasses over native serpentine species, the resulting change in community composition and habitat quality will depend on several factors. Proportional impacts resulting from on-going deposition will be lower in high pollution zones where impacts may already be acute; similarly, they will be higher in low pollution areas (Weiss 2006). Some of the serpentine grasslands in the study area, such as Tulare Hill and Kirby Canyon, already experience elevated nitrogen deposition levels (CH2M Hill 2004).

With continued N-deposition as a result of growth in the study area and the region, effective grazing management becomes critical to maintaining Bay checkerspot butterfly populations. N-deposition to Bay checkerspot butterfly habitats in Santa Clara County may be above the critical load (as defined above) well into the future, despite efforts to reduce vehicle emissions. It has proven possible to manage the effects of N-deposition on serpentine grasslands in the highest deposition areas on Tulare Hill and low elevation slopes of Coyote Ridge through grazing (S. Weiss pers. comm.). As discussed elsewhere, a flexible grazing regime that seeks to remove a maximal amount of grass each year compensates for high spatial and temporal variability in annual grass production, driven by weather and N-deposition.

The effects of N-deposition on serpentine grasslands and the Bay checkerspot butterfly are well documented (e.g., Weiss 1999). In the absence of grazing, increased growth of annual grasses and thatch build-up lead to decreased cover of host plants, nectar sources, and all native forb species over the course of 1–3 years (Weiss et al. 2007). This habitat shift has been observed every time grazing has been removed in the South Bay, including in the Silver Creek Hills, Santa Teresa Hills, Kirby Canyon Landfill, and in smaller exclosures (Weiss et al. 2007). Losses of host plants and nectar sources lead to population crashes, and ultimately local extinctions. These local extinctions have been observed at Edgewood County Park in San Mateo County. In contrast, grazed areas maintain high native cover and support Bay checkerspot butterfly populations as weather and local topography permit.

The impact of on-going deposition will also depend on the management of specific serpentine grasslands (Weiss 2006). Grazing and burning of grasslands, an important component of the Habitat Plan conservation strategy, are likely to be effective at controlling nonnative species and, consequently, maintaining the relative cover of native serpentine species, including the Bay checkerspot butterfly host plants (Weiss 1999, 2006).

## Vehicular Strikes

Covered activities that facilitate increased vehicular use in the study area will also contribute to an increase in vehicle strikes of Bay checkerspot butterfly. Increased traffic on existing roads is likely to result in higher vehicular strikes. However, the proportional impact of this level of mortality on population dynamics of this species is very small within large core populations such as on Coyote Ridge. Vehicular strikes have a greater impact on adult butterflies dispersing between habitat patches. Existing roads where an increase in vehicle traffic is expected as a result of covered activities and where vehicle strikes with Bay checkerspot butterfly are most likely due to road location, road configuration, and traffic patterns are:

- U.S. 101
- Metcalf Road
- Silver Creek Valley Road
- Monterey Highway
- Santa Teresa Boulevard (expected to be widened during the permit term)
- Dirt ranch roads through or near Bay checkerspot butterfly habitat.
- Roads in residential developments adjacent to butterfly habitat (e.g., Silver Creek Hills, residential areas along Basking Ridge Avenue).

Increased development in open areas between Bay checkerspot butterfly habitat (e.g., Coyote Valley) will also create new hazards and barriers to movement for this species.

## Conservation Strategy Implementation

Indirect effects to the Bay checkerspot and its associated habitat will be similar to those described previously in Section 4.3.7 *Conservation Strategy Implementation*. Implementation of the conservation strategy will increase access to bay checkerspot habitat and may result in increased take. Harm could result from reserve visitors trampling habitat, littering, and collecting nectar and larval host plants. Visitors may also harass adult butterflies during the flight season. However, effects associated with increased access to Bay checkerspot habitat will be greatly reduced by the Plan's conditions on recreation (see Chapter 6, Section 6.4.6, subheading *Condition 9 Prepare and Implement a Recreation Plan*). These effects will be minor and temporary, especially when compared to the net benefits gained from the Reserve System and the educational benefit afforded to the community through limited access to portions of the reserves.

## Other Covered Activities

Indirect effects of other covered activities will be largely avoided by implementation of conditions on covered activities (see Chapter 6, including subheading *Condition 13 Serpentine and Associated Covered Species Avoidance and Minimization*). Conditions placed on construction practices will limit construction dust and erosion. Populations next the Kirby Canyon landfill do not appear to be affected by dust, much of which occurs during the dry season when Bay checkerspot butterfly are in diapause. Erosion is a natural part of the butterfly habitat; nonetheless, conditions on covered activities will avoid erosion impacts. Use of hazardous chemicals will be avoided throughout the Reserve System, including core habitats, except for precisely targeted herbicide applications under the conservation strategy and adaptive management program.

### 4.6.2 California Tiger Salamander, California Red-Legged Frog, Western Pond Turtle

Several species of amphibians and reptiles utilize riverine habitats as discussed above but also use a wide variety of seasonal wetlands, marshes, ponds, and upland habitats during different times of the year. Ponds and wetlands in the study area provide breeding habitat for California tiger salamander, and breeding and year-round habitat for California red-legged frog and western pond turtle. All these species are affected by surrounding land uses because they also need sufficient upland habitat near breeding streams and other aquatic habitats (e.g., ponds, wetlands) to accommodate year-round uses (e.g., refugia, dispersal). For example, western pond turtles need upland habitat an average of 92 feet from breeding sites but up to 1,391 feet for nesting and overwintering (see species account for citations). Pond turtles also require sufficient basking sites in the water for year-round use (Crump 2001; Davis 1998).

The human-influenced water regime often does not facilitate successful breeding (e.g., if seasonal wetlands dry up prematurely, or if waters that were historically seasonal become perennial). Moreover, these water regimes often support nonnative species such as bullfrogs and predatory fish that eat young frogs and salamanders.

## Direct Effects

Covered activities that adversely affect seasonal wetlands, marshes, ponds, streams, or surrounding upland areas may directly affect these species. Individuals could be killed or injured by construction activities. Moreover, the removal or alteration of habitats upland of potential breeding sites may not allow individuals to complete their life cycles or move to other seasonal habitats. Activities that result in the loss of ground squirrel populations (e.g., rodent control) or in the removal or excavation of rodent burrows could result in the direct loss of individuals utilizing upland refugia. Covered activities that remove



vegetation from the edges of wetlands and riparian corridors or vegetation removal within aquatic habitats will reduce habitat heterogeneity and adversely affect these species. Covered activities that isolate breeding pools from adjacent upland habitats will reduce the overall productivity of these species. Isolation of many breeding sites could cause extirpation of local populations. Increased vehicular traffic following road widening or creation of new driveways/access roads within dispersal habitat for reptiles and amphibians will increase the number of individuals that are killed or injured on roadways.

No more than 52 acres of pond and 40 acres of wetland habitat will be permanently affected by covered activities, relative to a total of approximately 1,110 acres of pond habitat and 583 acres of wetland habitat throughout the study area (4.7% of pond and 7% of wetland habitat of the totals in the study area). In addition, no more than 9.4 stream miles will be permanently affected by covered activities, relative to the total of 2,392 miles of stream in the study area (0.4% of the total stream miles in the study area).

Permanent impacts on California tiger salamander modeled breeding habitat will not exceed 77 acres (7% of total modeled breeding habitat in the study area) and temporary impacts will not exceed 14 acres (1% of total modeled breeding habitat in the study area). Permanent impacts on California tiger salamander non-breeding modeled habitat will not exceed 12,855 acres (4% of total non-breeding modeled habitat in the study area) and temporary impacts will not exceed 1,529 acres (less than 1% of total modeled breeding habitat in the study area) (**Table 4-4**).

Permanent impacts on California red-legged frog modeled primary habitat will not exceed 299 acres (3% of total modeled primary habitat in the study area) and temporary impacts will not exceed 116 acres (1% of total modeled primary habitat in the study area). Permanent impacts on California red-legged frog modeled secondary habitat, which includes areas for refugia and dispersal, will not exceed 12,937 acres (4% of total modeled refugia habitat in the study area) and temporary impacts will not exceed 1,489 acres (less than 1% of total modeled secondary habitat in the study area) (**Table 4-4**).

Permanent impacts on western pond turtle modeled primary habitat will not exceed 1,824 acres (2% of total modeled primary habitat in the study area) and temporary impacts will not exceed 440 acres (less than 1% of total modeled primary habitat in the study area). Permanent impacts on western pond turtle modeled secondary habitat will not exceed 7,825 acres (3% of total secondary habitat in the study area) and temporary impacts will not exceed 986 acres (less than 1% of total secondary habitat in the study area) (**Table 4-4**).

Most of the impacts to California tiger salamander, California red-legged frog and western pond turtle occur due to conversion of habitat to developed land cover types within the San José, Morgan Hill and Gilroy planning limits of urban growth. Geographic specificity is provided below for impacts to modeled habitat in the Santa Cruz Mountains, valley floor, and Diablo Range for impacts calculated in GIS (see Section 4.4 *Impact Assessment Methods*). Impacts to

California tiger salamander and California red-legged frog critical habitat are detailed below (see Section 4.7 *Effects on Critical Habitat*).

Impacts to California red-legged frog, California tiger salamander and western pond turtle habitat in the Santa Cruz Mountains are expected to be limited to the Santa Cruz foothills. Impacts to California red-legged frog modeled primary and secondary habitat are expected to occur from dam seismic retrofit on all dams located in the Santa Cruz Mountains and implementation of flood protection projects in Uvas and Gavilan Creeks. Dam and reservoir maintenance is anticipated to impact potential breeding and upland habitat at the Calero, Guadalupe, and Vasona dams. Development within the planning limit of urban growth of Gilroy, rural development, bridge construction/reconstruction, and construction of County Park facilities and infrastructure is expected impact modeled secondary habitat adjacent to modeled primary habitat in the Santa Cruz foothills, especially along Uvas Creek and its lower tributaries.

For California tiger salamander, development within the Gilroy and Morgan Hill planning limits of urban growth, rural development, bridge construction/reconstruction, and construction/reconstruction of County Park facilities and infrastructure is expected to mainly impact modeled upland habitat, with impacts to modeled breeding habitat concentrated on the west side of Uvas Creek and the west side of the City of Morgan Hill. Dam and reservoir maintenance is anticipated to impact potential breeding and upland habitat at Calero and Calero-Fellows Dike.

Impacts to western pond turtle modeled primary and secondary habitat in the Santa Cruz Mountains are expected to be limited to the foothills. Impacts to western pond turtle modeled primary and secondary habitat are expected to occur from dam seismic retrofits on dams in the Santa Cruz Mountains, and implementation of flood protection projects in Uvas and Gavilan Creeks. Dam and reservoir maintenance is anticipated to impact potential habitat at Guadalupe and Vasona Creeks below dams. Development within the planning limit of urban growth of Gilroy, rural development, bridge construction/reconstruction, and construction of County Park facilities and infrastructure is expected impact both modeled primary and secondary habitat, with impacts to concentrated on the west side of Uvas Creek. Impacts locations from Rural Development, all Rural CIP, and all In-Stream CIP cannot be specified at this time. Two western pond turtle known occurrences are expected to be impacted by Gilroy urban development on the west side of Uvas Creek within the Santa Cruz Mountains.

Impacts to California red-legged frog, California tiger salamander, and western pond turtle habitat on the valley floor are expected to occur within the San José, Morgan Hill, and Gilroy planning limits of urban growth. Impacts to California red-legged frog modeled primary and refugia habitat are expected to occur from flood protection projects, vegetation management on lower Llagas Creek, and road upgrades/construction in East Little Llagas Creek. Development within the planning limit of urban growth of Morgan Hill, Gilroy, San José, rural development, bridge construction/reconstruction, and road improvements may impact California red-legged frog secondary habitat adjacent to primary habitat.

Impacts to California tiger salamander breeding and upland habitat are expected to occur on the valley floor within the San José, Morgan Hill, and Gilroy planning limits of urban growth. Impacts to breeding habitat are expected to occur along Upper and lower Llagas Creek, while impacts to upland habitat are expected to occur north and south of West Branch Llagas Creek, between the Uvas and Llagas Creeks throughout the Prince Valle Drain and Lower Miller Slough. All breeding habitat and most upland habitat within the Morgan Hill planning limit of urban growth are expected to be removed. This is expected to include the removal of one known occurrence on the northwest side of the Morgan Hill planning limit of urban growth from urban development. Development within the San José planning limit of urban growth, rural development, bridge construction/reconstruction, and road improvements are expected to impact upland habitat along Guadalupe, Calero, Santa Teresa, Upper Penitencia, Lower Silver, and Coyote creeks (between Lower Silver Creek and just north of Upper Penitencia Creek).

Impacts to western pond turtle primary and secondary habitat are expected to occur from flood protection projects, vegetation management on lower Llagas Creek, and road upgrades/construction in East Little Llagas Creek. Development within the planning limit of urban growth of Morgan Hill, Gilroy, San José, rural development, bridge construction/reconstruction, and road improvements are expected to impact primarily secondary habitat. One western pond turtle known occurrence is expected to be impacted at the Vasona Reservoir.

Impacts to California red-legged frog, California tiger salamander, and western pond turtle in the Diablo Range are limited to the Coyote Watershed, primarily within the San José planning limit of urban growth. For California red-legged frog, this includes impacts to primary and refugia habitat from dam seismic retrofits at Anderson Dam, implementation of flood protection projects on Coyote, Mid-Coyote, Upper Penitencia, Fisher, Lower Silver, Upper Silver, Berryessa, Quimby, Sierra, South Babb, and Thompson creeks; and levee reconstruction on Berryessa, Thompson, Coyote, and Upper Penitencia Creeks. Dam and reservoir maintenance is anticipated to impact potential breeding and upland habitat at the Coyote dam. Development within the planning limit of urban growth of San José, rural development, bridge construction/reconstruction, and construction of County Park facilities and infrastructure are expected to impact the lower stream reaches that serve as California red-legged frog primary habitat and adjacent secondary habitat. This is expected to include impacts to two California red-legged frog known occurrences on Metcalf Creek and Coyote Creek.

San José urban development within the planning limit of urban growth, flood protection projects, and levee reconstruction are expected to impact California tiger salamander upland habitat adjacent to Sierra, Upper Penitencia, Upper Coyote, Upper Silver, Thompson, Fowler, and Quimby creeks. Dam and reservoir maintenance is anticipated to impact potential breeding and upland habitat at the Anderson Dam. Two California tiger salamander known occurrences are expected to be impacted. One is adjacent to Thompson Creek and the other is between Coyote and Thompson creeks.

The impact locations for western pond turtle are similar to those from California red-legged frog. Impacts to western pond turtle primary and secondary habitat are expected to occur from dam seismic retrofits at Anderson Dam, implementation of flood protection projects in Coyote, Mid-Coyote, Upper Penitencia, Fisher, Lower Silver, Upper Silver, Berryessa, Fisher, Quimby, Sierra, South Babb, and Thompson creeks; and levee reconstruction and maintenance in Berryessa, Thompson, Coyote, and Upper Penitencia creeks. Dam and reservoir maintenance is anticipated to impact potential habitat on Coyote Creek below Coyote and Anderson dams. Development within the planning limit of urban growth of San José, rural development, bridge construction/reconstruction, and construction of County Park facilities and infrastructure are expected to impact the lower stream reaches that serve as primary habitat and adjacent secondary habitat.

SCVWD manages flows and diversions to meet water supply objectives. As discussed in Section 4.3.3, dry-back conditions may occur due to fluctuations in seasonal operations. SCVWD generally attempts to avoid stranding of aquatic species when flows are reduced using a ramped schedule for flow reduction. When in-channel flow reductions are made, wildlife may be stranded in isolated pools or downstream reaches. While adult individuals may have time to move out of the area, flow reductions occurring early in the year may affect amphibian egg sacs established on stream margins.

Conversely, during dewatering events, consistent high flows, if started early enough in the year and continued through late spring, may facilitate breeding by providing a reliable water source and may also reduce the potential for stranding. High flows are not expected to affect western pond turtle breeding as this species tends to lay its eggs in uplands away from the active channel. To ensure that impacts to covered amphibian species are avoided and minimized during dewatering events, SCVWD will develop a dewatering plan for review and approval by the Wildlife Agencies prior to commencing a dewatering activity. See Chapter 6 for additional information on the possible issues addressed by the dewatering plan.

The year following a dewatering event, flows are expected to be lower than normal. This will likely reduce the availability of egg laying substrate for amphibians.

Dry-back of channels may also occur due to maintenance activities, although this occurrence is much less common. For example, it may be necessary to reduce reservoir releases when a recharge diversion requires repair. Rapid dry-back could also occur if bypass flow (flow that remains in the channel) at a diversion is blocked by debris or other system failure. However, repairs of downstream diversions are likely to be implemented while maintaining some flow in the channel. Even a catastrophic failure for diverting water at a downstream diversion would likely not trigger a rapid in-stream dry-back; however, receiving ponds may experience a reduction in water level. All planned repairs requiring channel dewatering would incorporate bypass flow.

Amphibian larvae and tadpoles may also be affected by changes in water quality associated with operation of reservoirs and groundwater percolation ponds. These potential effects are discussed in Section 4.3.3. Key issues are increased fine sediments released from reservoirs or ponds that may cover egg sacs if releases are made early in the year. Increased turbidity from sediment and algae may inhibit foraging of adults if releases are made later in the year.

## Indirect Effects

Indirect effects resulting from human population growth and increased urbanization is expected to constrain or eliminate stream, pond, and/or wetland habitats and increase water temperatures, while decreasing sediment transfer and dissolved oxygen. Changes in land use in areas adjacent to breeding sites can reduce the overall habitat quality of upland sites for California tiger salamander, California red-legged frog, and western pond turtle. The rate of natural movement of salamanders among breeding sites depends on the distance between the ponds or complexes of ponds and of the quality of intervening habitat (e.g., salamanders may move more quickly through sparsely covered and open grassland than they can through densely vegetated lands) (Trenham 1998). Loss of habitat connectivity may affect species dispersal movements. An increase in urban development adjacent to breeding habitat would facilitate an increase in predators (e.g., feral cats, raccoons, and skunks) that decrease breeding success and predate reptiles and amphibians. This predation may have a detrimental impact on local populations.

Increased runoff from impervious surfaces into wetland areas carries pollutants that are harmful to reptiles and amphibians, which are particularly sensitive to contaminants and other pollutants in the water. An increase of impervious surfaces within a watershed due to urbanization may result in changes to in-stream flow, temperature, and stream geomorphology. Increases in impervious surfaces can also result in increased water pollutants in local streams, particularly during “first flush” rain events. Herbicides, pesticides, and other toxic materials can cause diminished production or mortality of aquatic covered species. Fertilizers and other organic materials can cause algal blooms that decrease dissolved oxygen levels, while fine sediments may degrade breeding habitat. Changes in land use that reduce natural land cover and increase impervious surfaces in areas adjacent to riverine habitats can also lead to increased disturbance of species (e.g., reduced foraging and reproductive success) due to increased sources of noise, light, neighborhood runoff (e.g., fertilizers, oil), and introduced species.

Covered activities that occur in aquatic habitat (i.e., in-stream capital projects, in-stream operations and maintenance, and monitoring) could facilitate the spread of disease such as chytridiomycosis. Increased public access to habitat supporting California tiger salamander, California red-legged frog, and western pond turtle will increase the potential for harm and harassment, and may also result in increased pollution, predation, and introduction of nonnative species.

### 4.6.3 Foothill Yellow-Legged Frog

Riverine habitats within the study area are subject to human-influenced flows that do not reflect the region's historical water regime. Species that occur in these habitats are usually affected by changes in land use adjacent to the riparian corridor and by the development of permanent infrastructure within the natural floodplain.

#### Direct Effects

Foothill yellow-legged frogs are expected to be affected by projects implemented within the stream channel or that result in the removal of cobblestone substrate or riparian vegetation, particularly in reaches above reservoirs. Ground-disturbing activities, such as maintenance of stream banks, levees, and channel rights-of-way (e.g., bank repair, vegetation management), could increase erosion and sediment discharge that could disrupt breeding of foothill yellow-legged frogs. Projects that place structures in the channel (e.g., culvert installation) or that require stream access may crush individuals or create permanent pooling habitat where higher risk of predation exists for adults, metamorphs, and tadpoles. If pulse flows from reservoirs (to aid migration by juveniles and smolts of listed fish) are released during the foothill yellow-legged frog egg-laying period, they could dislodge egg masses, causing mortality. However, this is unlikely because pulse flows will be release in winter months (January, February, and March) and are intended to simulate natural flow conditions (see Chapter 5 for details). The timing of oviposition (laying of eggs) for foothill yellow-legged frog typically follows the period of high-flow discharge from winter rainfall and snowmelt (Jennings and Hayes 1994; Kupferberg 1996), thus, pulse flows are expected to occur in advance of oviposition.

Although foothill yellow-legged frogs are not currently known to occur downstream of many of the dams in the permit area, remnant populations may be affected by the operation and maintenance of SCVWD's dams. SCVWD manages flows and diversions to meet water supply objectives. As discussed in Section 4.6.2, dry-back conditions may occur due to fluctuations in seasonal operations. There are events that cause operations to fluctuate substantially and rapidly. For example, it may be necessary to reduce reservoir releases when a recharge diversion requires repair. When in-channel flow reductions are made, amphibians may be stranded in isolated pools or downstream reaches that rapidly dry back as flow rapidly declines and the area of wetted channel is decreased. SCVWD generally attempts to avoid stranding of aquatic species when flows are reduced using a ramped schedule for flow reduction. Flow reductions may affect egg masses established on stream margins as well as larval food availability.

Dewatering events could aid breeding by providing a reliable water source and may also reduce the potential for stranding or could impact breeding by scouring egg masses and reducing the algal food base for larvae. To minimize the impacts to foothill yellow-legged frogs, SCVWD will develop a dewatering plan for review and approval by the Wildlife Agencies prior to commencing a dewatering

activity. See Chapter 6 for additional information on the possible issues addressed by the dewatering plan.

Permanent impacts to foothill yellow-legged frog modeled primary habitat will not exceed 1.9 stream miles, or less than 1% of the total modeled habitat for the species within the study area. Temporary impacts are will not exceed 0.7 miles of stream (less than 1%) of modeled habitat. Permanent impacts on foothill yellow-legged frog modeled secondary habitat will not exceed 4.8 miles (less than 1% of total secondary modeled habitat in the study area) and temporary impacts will not exceed 1.3 miles (less than 1% of total modeled secondary habitat in the study area) (**Table 4-4**).

Geographic specificity of impacts to foothill yellow-legged frog is provided below in terms of expected impacts to modeled habitat in the Santa Cruz Mountains, valley floor, and Diablo Range for impacts calculated in GIS (see Section 4.4 *Impact Assessment Methods*).

Impacts to foothill yellow-legged frog in the Santa Cruz Mountains are expected to be limited to the Santa Cruz foothills. Impacts to modeled primary and secondary habitat are expected to occur from dam seismic retrofit at Uvas Dam, Chesbro Dam, Almaden Dam, Calero Dam, and Guadalupe Dam. Impacts from implementation of flood protection projects are expected in Uvas Creek (secondary habitat) and Gavilan Creek (primary and secondary habitat). Dam and reservoir maintenance is anticipated to impact potential habitat at Guadalupe Dam. One known occurrence is expected to be impacted along Uvas Creek, north of its confluence with Bodfish Creek.

Impacts to foothill yellow-legged frog on the valley floor are expected to be limited to modeled secondary habitat in-streams within the San José, Morgan Hill, and Gilroy planning limits of urban growth. Impacts to secondary habitat are expected to occur from implementation of flood protection projects in East Little Llagas, Jones, Lions, West Branch Llagas, West Little Llagas, Alamitos, Arroyo, Canoas, Los Gatos, Randal, and Ross creeks; levee reconstruction in Lower Llagas, Llagas West, Jones, Lions, West Branch Llagas, Alamitos, Guadalupe, Canoas, Randol, and Los Gatos creeks, and the Guadalupe River; vegetation management on lower Llagas Creek; and road upgrades/construction near East Little Llagas Creek. Development within the planning limits of urban growth of Morgan Hill, Gilroy, San José, rural development, bridge construction/reconstruction, and road improvements are expected to impact foothill yellow-legged frog secondary habitat.

Impacts to foothill yellow-legged frog in the Diablo Range are expected to be limited to the Coyote Watershed, primarily within the San José planning limit of urban growth. Impacts are primarily expected to be to secondary habitat and occur from dam seismic retrofits at Anderson Dam; implementation of flood protection projects on Coyote, Mid-Coyote, Upper Penitencia, Fisher, Lower Silver, Upper Silver, Berryessa, Quimby, Sierra, South Babb, and Thompson creeks; levee reconstruction and maintenance in Berryessa, Thompson, Coyote, and Upper Penitencia creeks. Development within the planning limit of urban growth of San José, rural development, bridge construction/reconstruction, and

construction of County Park facilities and infrastructure are expected to impact the lower stream reaches that serve as foothill yellow-legged frog secondary habitat.

## Indirect Effects

Foothill yellow-legged frogs are expected to be indirectly affected by water flow and adjacent land uses within occupied watersheds.

Indirect effects on covered aquatic species are also derived from overall changes in impervious surface in the watersheds during the permit term. An increase of impervious surfaces within a watershed due to urbanization may result in changes to in-stream flow, temperature, and stream geomorphology. Increases in impervious surfaces can also result in increased pollutants entering local streams, particularly during “first flush” rain events. Herbicides, pesticides, and other toxic materials can cause diminished production or mortality of aquatic covered species. Fertilizers and other organic materials can cause algal blooms that decrease dissolved oxygen levels, while fine sediments may degrade breeding habitat. Changes in land use that reduce natural land cover and increase impervious surfaces in areas adjacent to riverine habitats can also lead to increased disturbance of species (e.g., reduced foraging and reproductive success) due to increased sources of noise, light, neighborhood runoff (e.g., fertilizers, oil), and introduced species.

Urban development and agriculture have historically been cited as the cause of degraded watershed health. However, a recent study implicates exurban land use as a significant contributor as well (Lohse et al. 2008). This study found that increases in exurban development within a watershed results in fewer observed areas of high quality in-stream habitat. In addition, the study indicates that exurban development may have a greater relative impact than urban development on stream conditions because exurban development generally occurs in areas that are less developed and have existing high quality habitat (Lohse et al. 2008).

Covered activities that occur in aquatic habitat (i.e., in-stream capital projects, in-stream operations and maintenance, and monitoring) could facilitate the spread of disease such as chytridiomycosis. Increased public access to habitat supporting foothill yellow legged-frogs will also increase the potential for harm and harassment. Increased public access to these areas may also result in increased pollution, predation, and introduction of nonnatives. These effects will be minimized through the implementation of conditions described in Chapter 6.

### 4.6.4 Western Burrowing Owl

Occupied nesting, potential nesting, and overwintering only habitats were modeled for the burrowing owl (see **Appendix D** for habitat requirements). Impacts to the species will differ depending on the type of burrowing owl habitat that is affected. Impacts to different types of burrowing owl habitat will require



different types of conservation actions to ensure the impacts are appropriately offset and that conservation of the species occurs. Impacts are discussed below for the three types of burrowing owl habitat. Impacts are also discussed below for individual owls that may occur in any of these habitat types.

As previously described in Chapter 1, take authorized by permits issued for this Plan that occur within the expanded study area for burrowing owl conservation will be the result of conservation strategy actions implemented for the burrowing owl. Take associated with any of the six other categories of covered activities described in Chapter 2 or conservation actions for species other than the burrowing owl are not covered by this Plan in the expanded study area for burrowing owl conservation.

## Direct Effects

### Occupied Nesting Habitat

Within the Habitat Plan study area and expanded study area for burrowing owl conservation, burrowing owl nesting habitat is limited to grassland, barren, and some agricultural land cover types, that are generally flat with an open view shed and active ground squirrel colonies (see **Appendix D** for habitat requirements). Most of the occupied nesting habitat is within the northern portion of the urban service area of the City of San José.

Based on what is known about the recent distribution of nesting burrowing owls in the study area (DeSante et al. 2007; Townsend and Lenihan 2007; California Natural Diversity Database 2012; Barclay 2007), and the propensity of burrowing owls to forage within 0.5 mile of nest sites during the breeding season (Haug and Oliphant 1990; Rosenberg and Haley 2004), there are an estimated 1,348 acres of occupied nesting habitat (defined as breeding sites and associated essential foraging habitat within 0.5 mile of nest sites) in the study area. This estimate excludes the expanded study area for burrowing owl conservation because the only covered activities that will occur there are those associated directly with burrowing owl conservation. A maximum of 198 acres (15%) of occupied burrowing owl nesting habitat could be lost to covered activities within the Habitat Plan study area. Temporary impacts will not exceed 20 acres (1%) of occupied nesting habitat in the Habitat Plan study area (**Table 4-4**). Areas that are considered burrowing owl nesting habitat but will not be impacted by covered activities include the San José International Airport. All of the expected impacts on occupied burrowing owl habitat from covered activities would occur within the City of San José as a result of urban development.

### Potential Nesting Habitat

There is an estimated 63,751 acres of potential nesting habitat in the study area. A maximum of 4,000 acres (6%) of potential burrowing owl nesting habitat in the permit area may be permanently affected by covered activities. Temporary

impacts will not exceed 604 acres (less than 1%) of potential nesting habitat (**Table 4-4**). This is valley floor habitat that is outside of 0.5 mile of current nest locations but within 7.5 miles (documented movement distances of banded owls in Santa Clara County) of known nest locations (**Figure 5-11**). Impacts to potential nesting habitat will occur primarily as the result of rural residential development in unincorporated County areas, San José, Gilroy, or Morgan Hill. Additional impacts are expected on some types of agricultural lands on the valley floor, where agricultural lands are converted to other uses (housing or commercial).

### **Habitat Used Only for Overwintering**

A maximum of 9,671 acres or 7% of modeled overwintering habitat in the Habitat Plan study area will be permanently affected by covered activities. Temporary impacts will not exceed 762 acres (less than 1%) of modeled overwintering habitat in the Habitat Plan study area (**Table 4-4**). Impacts to overwintering habitat will occur primarily as the result of rural residential development outside of the jurisdiction of San José, Gilroy, or Morgan Hill. Most of the impacts incurred on overwintering habitat will be under the jurisdiction of the County of Santa Clara. Additional impacts may occur as the result of roadway improvements (widening, bridge replacements) or stream maintenance in areas where burrowing owls have been documented using berms or levees along waterways.

### **Impacts on Individual Burrowing Owls**

As described above, take authorization for burrowing owls is primarily limited to loss or degradation of the three kinds of habitat for the species (occupied nesting, potential nesting, and overwintering). All forms of take of individual owls are possible. Loss (death) or injury could occur from implementation of many covered activities if active burrows or nests are not avoided. However, the potential for this is avoided through the implementation of Condition 15, described in Chapter 6. Similarly, filling burrows used by owls when the owls are foraging off site could cause the owl to abandon the site and subsequently die off site if the owls are not able to find new shelter or are otherwise put in harm's way (e.g., excessive exposure leading to predation by other species). Vehicle strikes are also possible on construction sites, particularly when traffic occurs close to active burrows or nests.

Harm or harassment may occur from construction or operations and maintenance activities if these activities disrupt normal foraging or nesting behavior. In some instances, harassment could be so severe that it causes an owl to abandon its nest or its active burrow. The potential for this is minimized through the implementation of Condition 15, described in Chapter 6.

Capture, harm, and harassment may also occur from surveying, monitoring, and management activities within the Reserve System or on managed lands. For

example, active translocation of owls may be used as part of the conservation strategy (see Chapter 5). While allowed under the Plan, this handling activity would capture, harm, and harass owls temporarily while they are being moved. Unsuccessful translocation efforts conducted on an experimental basis may also result in the death of individuals. Impacts on individual burrowing owls will be minimized through the implementation of Condition 15, described in Chapter 6.

Since burrowing owls are protected by the MBTA, take of owls in the form of death or injury will not be allowed under the federal permit for any covered activity<sup>16</sup>. The NCCP permit serves as authorization by CDFG for take of owls consistent with this Plan under the Fish and Game Code.

Until the owl population in the South Bay Population reaches the population growth trend described in Section 5.4.6, the Plan does not cover take of individual owls, except for conservation strategy implementation or if an exception to the passive relocation prohibition is granted (see Chapter 6, Condition 15, subheading *Passive Relocation*). Condition 15 and other avoidance measures described in Chapter 6 (e.g., adoption of speed limits on construction sites) will be used to avoid such impacts. Few exceptions to the passive relocation prohibition are anticipated. These provisions will maximize the possibility of success of the conservation strategy in Chapter 5 by initially preserving owls in the study area as much as possible.

Once the owl population in the South Bay Population reaches the population growth trend as described in Chapter 5, take of individual owls in all forms will be allowed under the Plan for all covered activities (avoidance and minimization measures described in Condition 15 will still be required with the exception that passive relocation will be allowed consistent with the process described in Chapter 6). Since the population is now in decline and because of the limitations of the population viability analysis (PVA) model, it is anticipated that at least a 10 year period is necessary for the conservation activities to have a positive effect and to detect that effect through monitoring and re-running of the PVA.

Once the target growth trend is reached and take of individual owls for all covered activities is allowed, the amount of allowable take will be determined annually by the Implementing Entity in partnership with the Wildlife Agencies based on owl monitoring data and population viability modeling. The amount of take annually will be the number of owls in excess of those needed to maintain the positive growth trend as determined by the PVA (**Figure 4-3**). Based on new data and modeling results, the Implementing Entity and the Wildlife Agencies may increase or decrease the allowable take each year to ensure that the biological goals and objectives of the Plan are met. If the positive growth trend is lost during implementation, take authorization would again be limited to all forms of take associated with the implementation of the burrowing owl conservation strategy or take associated with approved exceptions to the passive relocation prohibition.

<sup>16</sup> If burrowing owl is listed under the ESA, this Plan can at that point serve as a Special Purpose Permit under the MBTA.

Take of burrowing owls resulting from the expiration of temporary management agreements will only be authorized if the targeted population growth described in Chapter 5 is being met. The amount of take would be counted toward the annual take authorized for that year. The only exception to this rule is that take of owls associated with implementation of the conservation strategy may continue and is not counted towards the annual take limit.

## Indirect Effects

Indirect effects resulting from human population growth, increased urbanization of the valley floor, and the continued build out of the three cities covered by the Plan are expected to reduce the quality of western burrowing owl nesting (occupied and potential) and overwintering habitat. The predominant indirect effects on burrowing owls are anticipated to be increased harassment from people, increased vehicle-related disturbance (e.g., of nesting habitat near roads), increased vehicle strikes, isolation of individuals on vacant lots, predation by cats, and increased exposure to humans throughout the study area, including within the Reserve System.

### 4.6.5 Least Bell's Vireo

Least Bell's vireos breed in early successional riparian habitat during the spring and summer months. This habitat is the product of a dynamic riverine environment and is adversely influenced by human-altered riverine systems that minimize disturbance and disallow flooding.

## Direct Effects

Because of the rarity of the species in the study area and the importance of maintaining all individuals that occur, this Plan does not authorize take in the form of direct injury or mortality. The Plan also does not authorize take of nests or eggs (these restrictions are in compliance with the MBTA and California Fish and Game code.) Covered activities may result in take in the form of harm and/or harassment, although these effects will be minimized with the avoidance and minimization measures described in Chapter 6 (see Condition 16 *Least Bell's Vireo*). Covered activities that result in the removal or alteration of riparian habitat within the study area will affect riparian obligate songbirds such as least Bell's vireo. Moreover, any activity that diminishes dynamic riverine events (i.e., floods) that cause natural disturbance and create early successional habitats will reduce the amount of breeding habitat available for this species. This species is not only affected by the amount of breeding habitat available but also by land uses adjacent to the riparian corridor. Impacts on the species will be minimized through the implementation of Condition 16, described in Chapter 6.

Covered activities will not exceed 72 acres of permanent impacts on primary least Bell's vireo modeled habitat, or 2% of the total 3,097 acres of modeled

habitat in the study area. Temporary impacts will not exceed 43 acres (1% of total modeled habitat) of modeled habitat (**Table 4-4**).

Geographic specificity of impacts is provided in terms of impacts to potential habitat calculated in GIS (see Section 4.4 *Impact Assessment Methods*). Impacts to modeled habitat are limited to the Santa Cruz Mountains foothill and the valley floor in the South County. Impacts to least Bell's vireo modeled primary habitat are anticipated to occur along riparian corridors from dam seismic retrofit at Uvas Dam and Chesbro Dam, flood protection projects in Uvas and Llagas Creek watersheds, vegetation management on lower Llagas Creek, and road projects along East Little Llagas Creek.

## Indirect Effects

Least Bell's vireo is expected to be indirectly affected by water flows and adjacent land uses that alter associated riparian habitat within the study area. See Section 4.6.3 *Foothill Yellow-Legged Frog* subheading *Indirect Effects*, above, for a discussion of indirect effects on riverine natural communities and associated riparian corridors. In addition, breeding success can be reduced if adjacent land uses result in nonnative, or feral, nest predators (i.e., cats) or high numbers of parasitic brown-headed cowbirds.

## 4.6.6 Tricolored Blackbird

Tricolored blackbirds breed colonially in freshwater marshes and other wetland habitats with reeds, cattails, or other emergent or non-emergent wetland vegetation (such as blackberry). Further, this species needs foraging habitat adjacent to breeding sites to successfully nest and rear young.

## Direct Effects

Because of the rarity of the species in the study area and its high breeding site fidelity, this Plan does not authorize the removal of historic<sup>17</sup> or active breeding habitat. No direct impacts are allowed to active colonies. Potential tricolored blackbird breeding sites will be directly affected by covered activities that result in the removal or permanent alteration of wetlands, marshes, and vegetated ponds. Conversion of lands from native or agricultural land cover to urban use will result in the degradation of foraging habitat for this species.

Estimated impacts on tricolored blackbird habitat are shown in **Table 4-4**. Permanent impacts on tricolored blackbird modeled primary habitat and secondary habitat will not exceed 276 acres (3%) and 10,317 acres (8%) of

<sup>17</sup> If a pond or wetland has documented breeding within the past 5 years, it will not be directly impacted by covered activities. Best efforts will be used to determine historic use. Best efforts will include at a minimum, a CNDDB records search, discussion with local experts, and investigation of site for historic nesting materials.

modeled primary habitat and secondary habitat in the study area, respectively. Temporary impacts on tricolored blackbird modeled primary habitat and modeled secondary habitat will not exceed 93 acres (1%) and 768 (less than 1%), respectively.

Geographic specificity of impacts is provided in terms of expected impacts to modeled habitat calculated in GIS (see Section 4.4 *Impact Assessment Methods*). Impacts to tricolored blackbird modeled breeding habitat occur to stream reaches where impacts are expected to result from in-stream capital improvement, in-stream operations and maintenance, and road projects. Such covered activities include seismic retrofits, levee reconstruction, vegetation management on lower Llagas Creek, improvements to the Coyote Valley Parkway interchange, and road projects along East Little Llagas Creek.

The majority of the foraging habitat with San José, Morgan Hill, and Gilroy planning limit of urban growth is expected to be removed due to urban development. In the vicinity of Gilroy, this includes modeled foraging habitat adjacent to Uvas, West Branch Llagas, and Llagas creeks. Within the Morgan Hill planning limit of urban growth, all foraging habitat on the valley floor, as well as limited portions in the Santa Cruz foothills, is expected to be impacted. Within the San José planning limit of urban growth, impacts to modeled foraging habitat are limited to the Diablo foothills. This is expected to include modeled foraging habitat in the adjacent Canoas, Upper Silver, Fowler, Evergreen, Upper Penitencia, and Sierra creeks.

No impacts are allowed to active colonies (see Chapter 6, Section 6.6.1, subheading *Condition 17 Tricolored Blackbird*); however, it is anticipated that the colony located in Morgan Hill will likely relocate due to encroachment of development within foraging radius of the breeding site.

## Indirect Effects

The indirect impacts on tricolored blackbird and other native bird species that utilize pond and wetland habitats will be similar to those discussed above in Section 4.6.4 *Western Burrowing Owl*. More specifically, the predominant indirect effects of covered activities on tricolored blackbird are increased harassment from people; vehicle-related disturbance (e.g., of breeding habitat near roads); increased urban predators (e.g., cats, skunks, raccoons); and increased exposure to humans throughout the action area, including within the Reserve System. Edge effects associated with roads and urban development include increased light and noise, which can disrupt breeding and foraging behavior and inhibit communication necessary for successful mating. Changes to existing roadbeds, bridges, and/or barriers and guardrails can change sound characteristics in certain habitats, interfering with acoustic communication for some birds.

## 4.6.7 San Joaquin Kit Fox

The last documented breeding activity of San Joaquin kit fox within the study area occurred in 1992. Breeding may occur in the southeastern portion of the study area, although it is expected to be rare. San Joaquin kit fox may move through the southeastern portion of the study area between areas of known breeding activity outside the study area. Suitable movement habitat for San Joaquin kit fox is defined as annual grassland and oak savanna contiguous with grassland in the Pacheco Creek Watershed. Secondary foraging habitat occurs in agricultural fields and row crops adjacent to grassland areas within this watershed.

Because habitat fragmentation is a significant threat to kit fox, preservation of contiguous tracts of suitable habitat is of primary importance. Ideally, contiguous habitat should be expansive enough to provide both foraging and movement habitat and ultimately to support a viable breeding population (i.e., support one or more kit fox home ranges) should the species expand its breeding range in the future. Known breeding populations north of the study area represent the northernmost extent of the species' range. Maintaining connectivity between those populations and other known breeding populations south of the study area is critical to maintaining genetic diversity in the population. The southern portion of the Plan area is critical to maintaining this linkage.

### Direct Effects

Because of the rarity of the species in the study area and the importance of maintaining all individuals that occur, this Plan does not authorize take of San Joaquin kit fox in the form of injury or mortality. Take is authorized in the form of harm or harassment, although these effects will be minimized with the avoidance and minimization measures described in Chapter 6 (see Section 6.6.1, subheading *Condition 18 San Joaquin Kit Fox*).

Covered activities that occur along the Pacheco Creek corridor and in the portion of the study area south of Henry W. Coe State Park have the potential to affect San Joaquin kit fox. Any new rural development that occurs along the SR 152 corridor could fragment movement habitat and potentially affect movement patterns. Increased vehicular traffic following road widening or creation of new driveways or access roads within movement habitat may increase the risk of injury or death of kit fox on roadways (however, injury or death of kit fox by vehicular collisions is not authorized by this Plan). Any covered activities that require the excavation of burrows or removal of modeled habitat with existing California ground squirrel colonies have the potential to degrade kit fox habitat. Chapter 6, Section 6.6.1, subheading *Condition 18 San Joaquin Kit Fox* reduces the potential to injure or kill kit foxes that might be taking refuge in these burrows.

A maximum of 198 acres of modeled secondary kit fox habitat (less than 1% of modeled habitat), will be permanently removed or degraded and a maximum of 46 acres (less than 1% of modeled habitat) will temporarily affected by covered activities. A maximum of 28 acres of modeled secondary (low use) kit fox habitat (1% of modeled habitat), will be permanently removed or degraded and a maximum of 6 acres (less than 1% of modeled habitat) will temporarily affected by covered activities (**Table 4-4**).

## Indirect Effects

Indirect effects resulting from human population growth in Gilroy and increased urbanization along U.S. 101 south and SR 152 east of Gilroy have the potential to affect kit fox movement through the study area through habitat fragmentation, and may also affect availability of foraging areas and cover. Growing traffic pressures on SR 152 increase the risk of vehicle/kit fox conflict. The presence of road kill attracts predators such as kit foxes and exposes them to increased risk of vehicle strike. Increased risk of fire associated with roads (e.g., accidents and tossed lighted cigarette butts) may also harm or kill kit foxes and temporarily remove habitat.

Recreational uses on Plan Reserves have the potential to disturb denning kit foxes. However, these activities will be prohibited or limited to avoid or minimize adverse impacts on the species (see Chapter 6). Increased noise and lights from urban areas and harassment from pets have the potential to affect kit foxes along the urban-wildland interface. Feral cats increase competition for food and introduce disease.

### 4.6.8 Serpentine Plants

This section describes the direct and indirect effects of the covered activities on covered plants that occur exclusively or primarily in serpentine grassland or serpentine chaparral land cover types. The direct effects are described for each species; indirect effects are described at the end of the section for all serpentine-associated covered plants because indirect effects are similar for the entire group.

## Direct Effects

For each serpentine species listed below, direct effects on known occurrences and suitable habitat are discussed. The discussion includes information on the general location and population estimates of occurrences expected to be affected by covered activities, where these data are available. Population data are often incomplete or out of date due to inconsistent reporting to the state database (CNDDDB). In addition, population sizes reported in one year may not accurately represent long-term averages. Almost all of the covered species discussed in this section are herbaceous annuals or perennials (all but Coyote ceanothus, which is a woody perennial). Both annual and perennial herbaceous plants experience



yearly fluctuations in population numbers due to factors related to climate, disturbance, and chance. For all of these reasons, the population data provided below should be considered as a general overview only. Surveys conducted during Plan implementation of affected and protected populations will yield more accurate population data to be used in tracking impacts, land acquisition, and adaptive management.

In addition to estimates of location and population size of potential impacts, the discussion below includes the maximum allowable occurrence impact limit for each species and the impacts on modeled or suitable habitat.

## **Tiburon Indian Paintbrush**

Potential habitat for Tiburon Indian paintbrush exists in serpentine bunchgrass grassland within the study area. However, the two known extant occurrences in the study area appear to occur on a specific sub-type of serpentine soils (S. Weiss pers. comm.). Two of nine known extant occurrences of Tiburon Indian paintbrush occur within the study area (**Table 4-6**; California Natural Diversity Database 2012). Both of these are located along Coyote Ridge. One is on private land that may be protected as a mitigation site for expansion of the Kirby Canyon Landfill. The second occurrence is on a mitigation site for Bay checkerspot butterfly established by Waste Management, Inc for previous landfill development. Both occurrences are being monitored and managed by the Kirby Canyon Butterfly Trust; neither site is currently permanently protected.

Population estimates for this species exist for all except one of the occurrences. The total estimate of known populations reported in the CNDDDB is 1,687 individual plants (from estimates between 1988 and 2006). More recent surveys, in 2009, of the two occurrences in the study area counted 1,203 individuals. This species will only be affected by the implementation of the conservation strategy. Management actions (i.e., prescribed burning and livestock grazing) on the one occurrence currently under temporary easement may result in temporary effects. These management actions however, will result in a net benefit to the species and impacts are considered minor and temporary. No additional impacts are allowed to the species, even if more occurrences are discovered during the permit term.

All serpentine bunchgrass grassland in the study area is considered potential habitat for this species. A permanent impacts cap of 550 acres (5.3% of the total in the study area) is applied to impacts to the serpentine bunchgrass land cover type. An additional 91 acres (less than 1%) of temporary impacts to serpentine bunchgrass grassland is anticipated and is the maximum impact allowed (**Table 4-3**).

## **Coyote Ceanothus**

Coyote ceanothus is generally found growing on dry slopes in chaparral, grassland, and coastal scrub on serpentine soils. All three known occurrences of

Coyote ceanothus are located within the study area (**Table 4-6**; California Natural Diversity Database 2012). One of these occurrences is located northwest and southwest of Anderson Dam. This occurrence is the largest known. It is mostly on private land although a small portion of it occurs adjacent to Anderson Dam on SCVWD property and a small portion is located on Anderson Lake County Park. Much of the portion of the occurrence on SCVWD property is likely to be permanently impacted by a seismic retrofit of Anderson Dam or major maintenance of the dam. Because of the rarity of this species and the need to quantify the magnitude of the effects, additional analysis was conducted on this occurrence.

The size of the occurrence adjacent to Anderson Dam was estimated using data from previous surveys conducted by SCVWD botanists (2006 and 2007) combined with field surveys conducted on May 5 and 6, 2009. Field data were used to estimate the population density of Coyote ceanothus in three chaparral types mapped on high-resolution aerial photographs (from April 2006). The site includes unburned chaparral and an area of 100–200 acres that burned at varying intensities in 2003. The burn area supports a large population of young plants (most appeared to be 5–6 years old during 2009 surveys) many of which flowered for the first time in the spring of 2010 (U.S. Fish and Wildlife Service 2011).

The 2009 population estimate for this occurrence was 188,475 plants, the vast majority of which (99.5%, or 187,534) were 5–6 years old plants (J. Hillman pers. comm.). The young plants observed during May 2009 appeared to be healthy, and mortality from herbivory or other causes was not observed. The recent 5-year review indicates that many of the individual plants survived to reproductive maturity (U.S. Fish and Wildlife Service 2011). This survival rate is considered conservative because this species is highly adapted to post-burn reproduction and drought conditions and it is resistant to herbivory.

We used overlays of the maximum footprint of the Anderson Dam retrofit and the extent of the Dam Maintenance Program at this site (the boundaries of these projects mostly overlap, but not entirely) to estimate the number of individuals that could be impacted by covered activities. Based on this analysis, we estimate that 3,550 individuals (less than 2% of the total current population) will be affected. Almost all of the plants to be lost are from the 2003/04 crop. With a conservative survival rate for juvenile plants of 50%, the population could be reduced to 94,708 ( $= 187,534/2 + 941$  adults) by the time the covered activities occur (this assumes no recruitment into the population in the meantime, which is unrealistic). Dam seismic safety retrofit and activities associated with the Dam Maintenance Program would remove no more than 3.7% of the western portion of the Anderson population ( $= 3,550/94,708$ ).

A portion of the same occurrence of Coyote ceanothus located east of Anderson Dam could be affected by dam operations following a seismic retrofit. Currently, Anderson Reservoir is operated under storage restrictions because of seismic safety concerns. Under current restricted operations there is only a small chance that the dam would spill and this site could be inundated. However, after the seismic retrofit the reservoir would return to “normal” operations under which

there would be a higher probability that water level of the reservoir would rise to the current vegetation line (approximately equal to spillway elevation) for a portion of the water year. The size of this portion of the occurrence is estimated at 300 individuals, up to 100 of which (33%) may be impacted when the normal reservoir levels are restored (J. Hillman pers. comm.). All of the impacted plants are seedlings or young plants up to 3 years old in 2009. Therefore, all of these individuals germinated on the reservoir shoreline while storage levels were below average.

In summary, up to 3,650 individuals of the occurrence on either side of Anderson Dam could be removed by covered activities, or up to 5% of the total population<sup>18</sup>, whichever is smaller. This standard will be applied to the population as it existed during the 2009 surveys. It will not be applied to any new recruits that are a result of natural or artificial disturbance event such as fire.

Adverse effects to the other two Coyote ceanothus occurrences are not covered under this Plan. However, minor and temporary effects associated with management of these occurrences, if they are incorporated into the Reserve System, would be covered under this Plan since the net effect would be beneficial. No additional impacts are allowed to the species, even if more occurrences are discovered during the Permit term.

The other two occurrences are located on private property near Kirby Canyon Landfill and in Morgan Hill. A portion of the Morgan Hill occurrence is on the Morgan Hill serpentine conservation easement. Based on surveys conducted in 2010 these occurrences have approximately 150 and 600-650 individuals each (U.S. Fish and Wildlife Service 2011).

All serpentine bunchgrass grassland and mixed serpentine chaparral in the study area is considered potential habitat for this species. The maximum allowable permanent impact to serpentine bunchgrass grassland is 550 acres (5.3% of the total in the study area) (**Table 4-2**). The maximum allowable temporary impact to serpentine bunchgrass grassland is 91 acres (less than 1%) (**Table 4-3**). The maximum allowable impact to mixed serpentine chaparral is 131 acres (3.5% of the total in the study area) for permanent impacts and 30 acres for temporary impacts (less than 1% of the total in the study area) (**Tables 4-2 and 4-3**).

## Santa Clara Valley Dudleya

Santa Clara Valley dudleya is restricted to rocky outcrops in serpentine grassland and oak woodland. Land cover types in the study area that could support this species include serpentine/rock outcrop, serpentine bunchgrass grassland and, to a lesser degree, valley oak woodland, coast live oak woodland, and mixed oak woodland and forest. There are currently 207 known extant occurrences in the study area and 209 throughout California (**Table 4-6**; California Natural Diversity Database 2012). Of the extant study area occurrences, two occur in

<sup>18</sup> An impact cap of 5% of the Anderson Dam occurrence (rather than the 3.7% estimated impact) is established to account for error in the estimate of the total population size.

protected open space. One hundred fifty eight (158) occurrences of the 209 known occurrences are not yet recorded in the CNDDDB. All but one of these non-CNDDDB occurrences are on private property on Coyote Ridge (T. Marker pers. comm.), on County Parks parkland, and on Santa Clara Valley Water District land. Of the 209 known extant occurrences, two are in the San Martin area.

Overall, impacts to this species from covered activities are anticipated to be relatively small. The largest impacts will likely be through habitat loss in serpentine bunchgrass grassland and serpentine rock outcrop land cover types. A maximum of 550 acres (5.3% of total in study area) of serpentine bunchgrass grassland and 22 acres (8.5% of total in study area) of serpentine rock outcrop will be permanently affected. A maximum of 91 acres (less than 1% of total in study area) of serpentine bunchgrass grassland and 2 acres (0.6% of total in study area) of serpentine rock outcrop will be temporarily affected (**Table 4-2**).

A maximum of 11 known occurrences (5% of extant occurrences in the study area; **Table 4-6**) have the potential to be impacted by covered activities if no additional occurrences are found during the permit term. Impacts are anticipated to occur from urban development within the planning limit of urban growth, SCVWD canal reconstruction, and from dam and reservoir maintenance and dam seismic safety retrofits in the vicinity of Almaden Dam and Coyote Reservoir.

There are population estimates for 10 of the 11 occurrences to be impacted. These estimates, based on observations between 1992 and 2008, range from 10 to 1,800 plants per occurrence. The total for all 11 is 3,700 (California Natural Diversity Database 2012; J. Hillman pers. comm.). Forty-seven occurrences documented in the California Natural Diversity Database (2012) (those affected by covered activities and those not) have population estimates that total approximately 72,500. Therefore, if all 11 occurrences were impacted by covered activities, this would impact far less than 5% of the known individuals of Santa Clara Valley dudleya. This is likely a large overestimate of impact because there are at least 158 occurrences without data that could include large populations. Therefore, actual impacts are likely less than 1%. New occurrences of this species are discovered frequently (California Natural Diversity Database 2012) so it is highly likely that more occurrences will be discovered during Plan implementation. A maximum of three additional new occurrences (i.e., occurrences not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Table 5-16**. For each additional new occurrence impacted, new occurrences of good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts.

Based on this analysis, the impact on Santa Clara Valley dudleya from covered activities is not expected to have a long-term effect on the species' viability. This is due to the relatively small percentage of the population that will be affected, the low number of individuals affected, and the likelihood that more occurrences will be discovered and protected. The primary habitat of this species is serpentine/rock outcrop. Based on the impact analysis, up to 11% of this land

cover type will be permanently affected by covered activities. However, this proportion is likely an overestimate of impacts because Santa Clara Valley dudleya is often found on serpentine rock outcrops that were too small to be mapped. In addition, at least some of the occurrences within the planning limit of urban growth are likely to prove undevelopable due to the harsh terrain of the rock outcrops on which they occur. Because many more outcrops will be discovered and mapped within the Reserve System during Plan implementation, actual impacts are likely to be much less than 11% of available habitat.

## Fragrant Fritillary

Primary habitat for fragrant fritillary is serpentine bunchgrass grassland and secondary habitat includes annual grassland, northern coastal scrub/Diablan sage scrub, and oak woodland. The study area contains eight of 59 known extant occurrences of this species (**Table 4-6**). Thirty-five (35) of the known occurrences have population estimates from the 1980s, 1990s and 2000s. These range from a low of one individual up to a high of 4,000 individuals, with a total of 16,383 (California Natural Diversity Database 2012).

A maximum of one occurrence in the study area (13% of known occurrences in the study area) that contained eight individuals during a 2000 survey (California Natural Diversity Database 2012) may be impacted by urban development (it is located within the planning limit of urban growth). In addition, it is possible that newly discovered occurrences of this species could be impacted by covered activities during Plan implementation. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Table 5-16**. For each additional new occurrence impacted, new occurrences of good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts.

Impacts to habitat can also occur from other covered activities. A maximum of 550 acres of modeled primary habitat and 2,729 acres of modeled secondary habitat (6% and 2% of modeled habitat, respectively) may be permanently affected. A maximum of 59 acres of modeled primary habitat and 655 acres of modeled secondary habitat, less than 1% of each of total modeled primary and secondary habitat, may be temporarily impacted (**Table 4-4**). Dam and reservoir maintenance could result in small permanent and temporary impacts to modeled species habitat.

## Most Beautiful Jewelflower

Suitable habitat for this species includes primary habitat in serpentine bunchgrass grassland, serpentine rock outcrops/barren, and mixed serpentine chaparral. Secondary habitat includes non-serpentine rock outcrops. Of the 86 total known extant occurrences of this species known, 39 of them are located in the study area

(**Table 4-6**; California Natural Diversity Database 2012; J. Hillman pers. comm.). Up to six occurrences (7% of the total known) may be impacted by covered activities if additional occurrences are not discovered during the permit term. One of these is located within the planning limit of urban growth in Morgan Hill, northeast of Chesbro Reservoir, one is located within the expected impact area for SCVWD canal reconstruction, and four are located near Almaden, Anderson, and Chesbro dams and may be impacted by seismic retrofit and/or dam maintenance activities during the permit term.

In addition, it is possible that newly discovered occurrences of this species could be impacted by covered activities during Plan implementation. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Table 5-16**. For each additional new occurrence impacted, new occurrences of as good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts.

Forty of the 86 known occurrences have population estimates. These range from 1 individual to 10,000; however, most estimates are in the low hundreds. These estimates were gathered between 1991 and 2008. The total estimate for all occurrences is 44,549. The six occurrences that will be impacted have a total population estimate of 1,076. Therefore, impacts to this species as a whole will be relatively small. In addition to the 86 recorded occurrences, there are 68 “jewelflower” occurrences on one private property that have not been identified to species, but are either most beautiful jewelflower or Metcalf Canyon jewelflower. This property will be acquired and included in the Reserve System. This also reduces the likely overall impact of covered activities on this species.

A maximum of 550 acres (4% of the total in the study area) of primary modeled habitat will be permanently affected by covered activities, and a maximum of 92 acres (less than 1% of the total in the study area) of primary modeled habitat will be temporarily affected (**Table 4-4**). No secondary habitat is anticipated to be impacted. Dam and reservoir maintenance and dam seismic safety retrofits could result in permanent and temporary impacts to habitat in the vicinity of the Coyote, Almaden, and Anderson dams.

## Metcalf Canyon Jewelflower

Suitable habitat for Metcalf Canyon jewelflower includes serpentine bunchgrass grassland and serpentine rock outcrops. There are 11 known extant occurrences of Metcalf Canyon jewelflower, 10 of which occur within the study area (**Table 4-6**; California Natural Diversity Database 2012). There is one occurrence near Lexington Reservoir that is outside the study area. Of these 10, the maximum allowable permanent impact is two (20% of known occurrences) occurrences under the Plan (**Table 4-6**). No additional impacts are allowed to this species, even if more occurrences are protected during the Permit term. Population estimates are available for only four of the known occurrences; three

of these estimates date from 1989 and one from 2006. They are 27, 40, 1,000, and 5,000, for a total of 6,067 individuals (California Natural Diversity Database 2009).

CNDDDB occurrence numbers 4 and 8 are expected to be impacted by SCVWD operations and maintenance activities on the Coyote Canal. Occurrence 8 was surveyed in 1989 and found to have 40 individuals. Occurrence 4 was surveyed in 1989 and found to include 5,000 individuals. Impacts to these occurrences are expected to be “partial impacts” as defined in Condition 20 of Chapter 6.

A maximum of 550 acres (7% of the total in the study area) of modeled primary habitat will be permanently affected, and a maximum of 62 acres (less than 1% of the total in the study area) of modeled primary habitat will be temporarily affected by covered activities (**Table 4-4**).

## Smooth Lessingia

Suitable habitat for smooth lessingia includes serpentine bunchgrass grassland and serpentine rock outcrops. All 39 extant occurrences of smooth lessingia are located within the study area, which comprises the entire range of this species (**Table 4-6**; California Natural Diversity Database 2012). There are estimates for 22 of these occurrences and the numbers for some of them are quite high (10,000 for two and 57,400 for another). There are also lower numbers in the 100–200 range, but on the whole this species tends to have high numbers where it occurs. The total of the 22 occurrences with estimates is 101,629 individuals, and these estimates are mostly from 2003–2008, although there are three from 1996, 1999 and 2000 (California Natural Diversity Database 2012; J. Hillman pers. comm.).

Impacts from covered activities may occur on a maximum of six occurrences from SCVWD canal reconstruction, dam seismic safety retrofits, or dam maintenance activities to Almaden Dam, Anderson Dam, Calero Main Dam, and Chesbro Dam (**Table 4-6**) if no additional occurrences are discovered. Prior to impact, two occurrences must be protected for every permanent impact to one occurrence. Dam retrofits and maintenance activities will impact an estimated 6,000 individual plants (30 at Almaden Dam, 3,600 at Chesbro Dam, 175 at Calero Main and 5,800 near Anderson Dam), based on 2006 surveys conducted by SCVWD. Canal reconstruction is estimated to impact approximately 6,500 individuals, according to surveys conducted by SCVWD in 2008.

In addition, it is possible that newly discovered occurrences of this species could be impacted by covered activities during Plan implementation. A maximum of three additional new occurrences (i.e., occurrence not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Table 5-16**. For each additional new occurrence impacted, new occurrences of as good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts.

Some covered activities may create partial impacts to smooth lessingia occurrences as defined in Chapter 6, Section 6.6.2, subheading *Condition 20 Avoid and Minimize Impacts to Covered Plant Occurrences*. If partial impacts occur, some of these may not count as a permanent impact and therefore would not require preservation of other occurrences to offset them. If partial impacts occur, the requirements in Condition 20 must be followed, including monitoring of the affected occurrence to ensure that the occurrence continues to be viable.

A maximum of 2 acres (less than 1% of the total in the study area) of serpentine/rock outcrop will be temporarily affected, and a maximum of 22 acres (8.5% of the total in the study area) will be permanently affected by covered activities. A maximum of 91 acres (less than 1% of the total in the study area) of serpentine bunchgrass grassland will be temporarily affected, and maximum of 550 acres (5.3% of the total in the study area) will be permanently affected by covered activities (**Tables 4-2 and 4-3**).

A maximum of 550 acres (5% of the total in the study area) of modeled primary habitat will be permanently affected, and a maximum of 68 acres (less than 1% of the total in the study area) will be temporarily affected by covered activities (**Table 4-4**).

## Mt. Hamilton Thistle

Primary habitat for Mt. Hamilton thistle is serpentine seeps or serpentine soils or grasslands within 25 feet of riverine habitat. There are 48 known extant occurrences of Mt. Hamilton thistle throughout its range and 40 of them are in the study area (**Table 4-6**; California Natural Diversity Database 2012; J. Hillman pers. comm.). The maximum impact limit for this species is six occurrences (12% of known occurrences) if no additional occurrences are discovered during the permit term. This includes occurrences within the planning limit of urban growth, two that will be impacted by SCVWD canal reconstruction, and one that is adjacent to, and likely to be affected by, the seismic retrofit of Anderson Dam. The six impacted occurrences are all located east of U.S. 101. It is expected that at least one of the impacts to Mt. Hamilton thistle will qualify as a partial impact (as defined in Condition 20 of Chapter 6) and therefore would not count toward the total impacted occurrences for the species.

In addition, it is possible that newly discovered occurrences of this species could be impacted by covered activities during Plan implementation. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Tables 5-16**. For each additional new occurrence impacted, new occurrences of good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts.



There are population estimates for 36 occurrences of this species, from as early as 1983 up to as recently as 2008. The range in population is from 1 to 4,500, and totals 28,962. There are estimates for all six potentially impacted occurrences, totaling approximately 9,500 individuals (California Natural Diversity Database 2012; J. Hillman pers. comm.).

Impacts to modeled habitat are limited to a maximum of 26 acres of permanent impacts (5% of the total habitat modeled in the study area) and 4 acres of temporary impacts (less than 1% of the total habitat modeled in the study area) (**Table 4-4**). Included in these impact limits are impacts associated with recharge operations, dam and reservoir maintenance and dam seismic safety retrofits, which were difficult to estimate because of the broad scale of Plan land cover mapping.

The Mt. Hamilton thistle is one of eight covered species addressed in the *Recovery Plan for Serpentine Species of the Bay Area* (U.S. Fish and Wildlife Service 1998). At the time the recovery plan was written, known occurrences of Mt. Hamilton thistle were distributed nearly evenly on the east and west side of U.S. 101. Many more occurrences have since been identified, most of which are located on the serpentines areas in and around Coyote Ridge on the east side of U.S. 101. It is for this reason that the Plan will focus conservation efforts for the Mt. Hamilton thistle on acquiring occurrences on the east side of U.S. 101 (J. Hillman pers. comm.).

## Indirect Effects

One of the primary, and possibly the most critical, potential indirect effects to serpentine plants is nitrogen deposition, as described above, under Bay checkerspot butterfly Indirect Effects (Section 4.6.1 *Bay Checkerspot Butterfly*). Nitrogen deposition associated with use of local and regional roads has led to an increase in nitrogen availability in the nitrogen-depleted serpentine soils. In turn, this has led to an increased ability for nonnative plants, primarily nonnative annual grasses, to establish in the serpentine, and outcompete the covered serpentine endemic species.

Additionally, new trails and facilities associated with the Reserve System will increase public access to areas that had not previously been accessible. An increase in foot traffic in reserves may increase the risk of invasion by nonnative species and could facilitate opportunities for illegal collection of covered species.

Indirect effects could also occur from increased risk of wildfire in serpentine species' habitat. However, since most native plants in these habitats are adapted to a burn regime, this impact may not be detrimental to certain covered plant species.

## 4.6.9 Non-Serpentine Plants

Non-serpentine plant species covered by the Plan have a wide variety of habitat requirements and are distributed throughout the study area, though typically outside urban areas. The potential for covered activities to permanently remove individuals or habitat varies with the species. Because these species are often found in the low hills east of U.S. 101 or in the Santa Cruz Mountains, several of the issues discussed for serpentine plants and Bay checkerspot butterfly also apply to this suite of species. Direct effects for each species are discussed individually below; indirect effects are discussed at the end of the section for all the species together, as these effects generally impact the entire group similarly.

### Direct Effects

Plant occurrences in habitats other than serpentine grassland could be affected by any of the Covered Activities; however, they are most likely to be affected by rural residential development. Rural residential development is expected to remove suitable habitat for these species, particularly in the Santa Cruz Mountains and in some of the low hills east of U.S. 101 that are unprotected. Moreover, the increase in infrastructure that is associated with rural development (e.g., roads, water conveyance) is expected to permanently remove suitable habitat and could kill individuals if they are not discovered prior to construction. Because most of these species occur in areas where the general land use is not likely to change during the permit term, long-term population viability should not be affected. Operations and maintenance activities that require accessing areas off established roadways could cause individuals to be crushed or habitat to be altered. If such activities require vegetation clearing or ground disturbance, they could remove suitable habitat for covered plant species. Additionally, Plan implementation activities, such as controlled burns and livestock grazing, could affect covered plant species. The Plan also includes many types of monitoring which can occasionally have impacts on individual plants in the form of trampling or soil disturbance. In both these cases, the benefits from Plan implementation are expected to greatly outweigh any negative effects of implementation.

For each non-serpentine species below, direct effects on known occurrences and suitable habitat are discussed. The discussion includes information on the general location and population estimates of occurrences expected to be affected by covered activities, where these data are available. Population data are often incomplete or out of date due to inconsistent reporting to the state database (CNDDB). In addition, population sizes reported in one year may not accurately represent long-term averages. All of the covered species discussed in this section are annuals. Annuals experience yearly fluctuations in population numbers due to factors related to climate, disturbance, and chance. For all of these reasons, the population data provided below should be considered as a general overview only. Surveys conducted during Plan implementation of affected and protected occurrences will yield more accurate population data to be used in tracking impacts, land acquisition, and adaptive management.

In addition to estimates of location and population size of potential impacts, the discussion below includes the maximum allowable occurrence impact limit for each species and the impacts on modeled or suitable habitat.

## Loma Prieta Hoita

Suitable habitat for Loma Prieta hoita occurs in mixed oak woodland and coast live oak forest and woodland (primary habitat) and northern mixed chaparral/chamise chaparral and mixed serpentine chaparral (secondary habitat). Fourteen of 26 known extant occurrences of this species are located in the study area. No occurrences of this species will be impacted by covered activities if additional occurrences are not discovered during the permit term (**Table 4-6**). It is possible that newly discovered occurrences of this species could be impacted by covered activities during Plan implementation. A maximum of two additional new occurrences (i.e., occurrences not yet known) may be impacted by covered activities if additional new occurrences are protected according to the conditions described in Section 4.4.1 *Direct Effects* subheading *Effects on Plant Occurrences* and protection requirements described in Chapter 5 and **Table 5-16**. For each additional new occurrence impacted, new occurrences of as good or better condition than the new occurrences impacted by covered activities must be protected within the Reserve System prior to impacts. Of the 26 known occurrences, 18 have population estimates, most of which are from 2004–2006, with one from 1995 and one from 2002. They range from 20 to 3,000 individuals and total 7,260 (California Natural Diversity Database 2012).

Maximum allowable impacts to modeled primary habitat are 2,117 acres (2%) of permanent impacts and 413 acres (less than 1 %) of temporary impacts. A maximum of 266 acres (1%) of modeled secondary habitat may be permanently impacted, and 60 acres (less than 1%) may be impacted temporarily impacted (**Table 4-4**).

## Indirect Effects

New trails and facilities associated with the Reserve System will increase public access to areas that had not previously been accessible. Such an increase in foot traffic and trails could increase the risk of invasion by nonnative species which can result in the permanent loss of habitat for covered species. Increased access also increases the possibility of collection, disturbance, injury or mortality from trampling by humans or domestic animals (e.g., dogs, horses, etc.).

Indirect effects could also occur from increased risk of wildfire in covered species' habitat. However, since most native plants in these habitats are adapted to a burn regime, this impact may not be detrimental to certain covered plant species.

## 4.7 Effects on Critical Habitat

Critical habitat is defined in Section 3 of the ESA as:

1. The specific areas within the geographical area occupied by a species at the time it is listed in accordance with the Act, on which are found those physical or biological features
  - a. essential to the conservation of the species and
  - b. that may require special management considerations or protection; and
2. Specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

A summary of effects on critical habitat is provided in **Table 4-9**. A discussion of effects of covered activities on critical habitat in the study area is provided below.

### 4.7.1 Bay Checkerspot Butterfly

Critical habitat was redesignated for Bay checkerspot butterfly in 2008 [73 FR 50405–50452]. Most of the designated critical habitat is within the study area boundary (**Figure 4-4**). In fact, 10 of the 13 units or 16,601 acres of the designated 18,293 acres (91%) fall within the study area. This critical habitat includes serpentine and California annual grasslands that stretch from southern San José to just south of Morgan Hill. The five primary constituent elements for Bay checkerspot butterfly are:

1. The presence of annual or perennial grasslands with little to no overstory that provide north–south and east–west slopes with a tilt of more than 7 degrees for larval host plant survival during periods of atypical weather (for example, drought).
2. The presence of the primary larval host plant, dwarf plantain (*Plantago erecta*), and at least one of the secondary host plants, purple owl’s-clover (*Castilleja densiflora*) or exserted paintbrush (*Castilleja exserta*), are required for reproduction, feeding, and larval development.
3. The presence of adult nectar sources for feeding.
4. Soils derived from serpentinite ultramafic rock (Montara, Climara, Henneke, Hentine, and Obispo soil series) or similar soils (Inks, Candlestick, Los Gatos, Fagan, and Barnabe soil series) that provide areas with fewer aggressive, nonnative plant species for larval host plant and adult nectar plant survival and reproduction.
5. The presence of stable holes and cracks in the soil, and surface rock outcrops that provide shelter for the larval stage of the Bay checkerspot butterfly during summer diapause.

The 16,601 acres of designated critical habitat for the Bay checkerspot butterfly in the study area includes 7,616 acres of modeled habitat for the Bay checkerspot butterfly and 8,985 acres of additional areas outside the Plan's modeled habitat. Critical habitat areas that do not support serpentine soils and vegetation are included in the designation because USFWS concluded that they "likely play an important role in dispersal of adult butterflies from one habitat patch to another" (73 FR 50405-50452). Although Bay checkerspot butterfly tend to show high fidelity to patches of serpentine grassland, a small but important number (estimated to be 10% or less), will leave serpentine bunchgrass areas (see **Appendix D**).

Critical habitat as defined by the primary constituent elements may be affected by covered activities as described below.

Continued urban and rural growth on the east side of Coyote Creek in and near the Silver Creek hills would result in the conversion of critical habitat into developed land cover types. Any conversion of habitat would also result in a complete loss of primary constituent elements. An increase in vehicles on local highways, as well as highways throughout the San Francisco Bay Area, will result in increased nitrogen deposition which would reduce the quality of designated critical habitat. In addition, several of the critical habitat units are near urban areas which may limit the types of management (i.e., fire) used to return these sites to a more natural state. Public access to Plan reserves would further affect critical habitat units by facilitating transfer of invasive plants into areas that were previously inaccessible, or by treading on individuals, larvae, and host plants. However, this Plan targets the acquisition of most of the core habitat areas identified in this Plan. Grazing will be a key management tool used within reserves and it is expected that careful grazing management will successfully rehabilitate degraded serpentine areas and protect existing habitat from the stressors of nitrogen deposition and competing plants. Furthermore, within the Reserve System, trails and recreational use will only be allowed if it is consistent with the biological goals and objectives of the Plan. As such, the potential for impacts associated with recreation will be minimized in reserves. Protection of critical habitat and proper management will result in the preservation of the primary constituent elements of Bay checkerspot butterfly habitat within the Reserve System.

Impacts to modeled primary Bay checkerspot butterfly habitat are capped at 300 acres and impacts to serpentine bunchgrass grassland are capped at 550 acres. No more than 550 acres (less than 3%) of Bay checkerspot butterfly critical habitat in the study area associated will be lost as a result of covered activities in this Plan (**Table 4-9**). This estimate does not include nitrogen deposition impacts.

The impact analysis does not identify impacts by critical habitat unit; however, impacts to Bay checkerspot butterfly habitat is limited to 3% of the unprotected portion (everything except Type 1 open space) of any core or satellite habitat unit targeted for conservation (as defined in **Table 5-7**) with the exception of the Kirby/East Hills core unit which has a 11% allowance to accommodate the Kirby Landfill expansion (80 acres) and the Pound Site core habitat unit which has an

13% allowance to accommodate the Mariposa Lodge/Sheriff's Firing Range project (approximately 27 acres).

There are more core habitat units identified for this Plan than critical habitat units, but core habitat does largely overlap with critical habitat designations. The impact caps for each core habitat unit are intended to ensure that core habitat will continue to function as habitat for the butterfly. Therefore, it is expected that limits on core habitat development will also ensure that units of critical habitat continue to function for Bay checkerspot butterfly.

**Table 5-21** describes estimated acreages of Bay checkerspot butterfly critical habitat that will be preserved within the Reserve System by unit. As shown, no conservation for critical habitat units 9b and 12 is anticipated for this Plan. Unit 9b is located in the foothills of the Santa Cruz Mountains at the southern tip of the Coyote Valley Urban Reserve, just outside of the planning limit of urban growth for the City of San José. It also borders a portion of the Coyote Valley Greenbelt. This area is unincorporated and is characterized by the Ranchland/Woodland land use type (**Figure 2-2**) which allows a maximum development density 1 dwelling unit per 20 acres. No water or transportation projects are planned for this site (**Figures 2-6 and 2-7**). While it is possible that this unit could be affected by rural development permitted by this Plan, due to the location of the site (outside urban areas), development density requirements, and the small size of the unit (only 56 acres), it is not expected that this unit will experience much development.

Unit 12 is located in the foothills of the Santa Cruz Mountains between the planning limits of urban growth for the Cities of Morgan Hill and Gilroy. A portion of this unit borders the western edge of the unincorporated community of San Martin. This unit is in unincorporated lands and is characterized by the Ranchland/Woodland land use type. No water or transportation projects are planned for this site (**Figures 2-6 and 2-7**). Approximately 52% of unit 12 is currently protected as Type 1 Open Space. While it is possible that this unit could be affected by rural development permitted by this Plan, due to the location of the site (outside urban areas) and development density requirements, it is not expected that this unit will experience much development.

## 4.7.2 California Tiger Salamander

Critical habitat was designated for the central population of California tiger salamander in 2005 [70 FR 49380–49458]. There are eight critical habitat units within the study area (East Bay Region Units 5–12) (**Figure 4-5**). The study area supports 28,096 acres of critical habitat, including 92 acres of modeled breeding habitat and 27,235 acres of modeled non-breeding habitat (**Table 4-9**).

The three primary constituent elements for California tiger salamander are:

1. Standing bodies of fresh water including natural and manmade (e.g., stock) ponds, vernal pools, and other ephemeral or permanent water bodies which

typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall.

2. Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat that CTS depend upon for food, shelter, and protection from the elements and predation.
3. Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Nearly all the critical habitat units are in or on the periphery of urban areas, meaning that urban development, rural residential development, and any associated infrastructure (e.g., roads, water conveyance) could affect this critical habitat. Such impacts are less likely in units 11 and 12 because these areas are in the far east hills of the study area where fewer covered activities are anticipated. Operations and maintenance activities will affect all units in the study area, particularly those associated with aquatic resources that serve as potential breeding habitat. Covered activities that result in a change in land use adjacent to potential breeding habitat, particularly if the change in land use includes control or elimination of burrowing mammals, would result in a loss of important upland habitat for the species, including the primary constituent elements listed above, and reduce the overall habitat quality for year-round occupation. Avoidance and minimization measures described in Chapter 6 will reduce the potential for indirect impacts on critical habitat.

No more than 272 acres (1%) of all California tiger salamander critical habitat in the study area will be affected by covered activities in this Plan (**Table 4-9**). The impact analysis does not identify impacts by critical habitat unit; rather, it identifies impacts grouped by all critical habitat present in the study area. However, 97% of all critical habitat was also mapped as breeding or non-breeding habitat for this Plan. Impacts to breeding and non-breeding habitat are quantified and discussed in Section 4.6.2 *California Tiger Salamander, California Red-legged Frog, Western Pond Turtle*.

**Table 5-21** also describes estimated acreages of California tiger salamander critical habitat that will be preserved within the Reserve System by unit. As shown, little to no critical habitat in units EB-9, EB-10A, and EB-11 is anticipated to be included in the Reserve System. Unit EB-9 is located in the Diablo Range east and south of Coyote Reservoir. A large portion of unit EB-9 is located in the Palassou Ridge Open Space Preserve (Type 2 Open Space). The portion south of the reservoir is split across Coyote Lake Harvey Bear Ranch County Park (Type 3 Open Space) and the Ranchland/Woodland land use type. No water or transportation projects are planned for this site (**Figures 2-6 and 2-7**). Open space areas account for approximately 66% of this unit. While it is possible that some covered activities occur within the open space, it is expected to be minimal. It is also possible that this unit could be affected by rural development permitted by this Plan. However, due to the location of the site (outside urban areas), development density requirements, and portion of this unit that is available for development (approximately 34%), it is not expected that this unit will experience much development.

Unit EB-10A is located in the foothills of the Santa Cruz Mountains between the planning limits of urban growth for the Cities of Morgan Hill and Gilroy. This unit largely overlaps Bay checkerspot critical habitat unit 12. Permanent impacts to Bay checkerspot butterfly modeled primary habitat that overlaps Bay checkerspot butterfly critical habitat is capped at 300 acres to meet regulatory standards (**Table 4-9**). Subsequently, it is likely that permanent impacts in the portion of California tiger salamander critical habitat unit EB-10A that overlaps with Bay checkerspot critical habitat unit 12 will be minimal. A portion of this unit borders the western edge of the unincorporated community of San Martin. This unit is in unincorporated lands and is characterized by the Ranchland/Woodland land use type. No water or transportation projects are planned for this site (**Figures 2-6 and 2-7**). None of this unit is currently protected by any type of open space. While it is possible that this unit could be affected by rural development permitted by this Plan, due to the location of the site (outside urban areas) and development density requirements, it is not expected that this unit will experience much development.

Unit EB-11 is located in the Diablo Range east and somewhat south of unit EB-9. Approximately 94% of this site currently located within Henry Coe State Park. Activities occurring within Henry Coe State Park are not covered by this Plan. As such, a maximum of 6% of this site could be affected by the covered activities of this Plan. However, no water or transportation projects are planned for this site (**Figures 2-6 and 2-7**). This site is located in the far east portion of the study area and is unlikely to receive much rural development. As such, it is not expected that this unit will be substantially affected by the covered activities of this Plan.

### 4.7.3 California Red-Legged Frog

Critical habitat was designated for California red-legged frog in 2010 [75 FR 12816–12959]. The two main critical habitat units in Santa Clara County are STC-1 (52,283 acres) which is entirely within Santa Clara County and STC-2 (204,718 acres in total, 97,214 acres of which are in the study area) which extends west into Stanislaus County and south into San Benito County (**Figure 4-6**). Santa Clara County also contains a small section of ALA-2 (1,465 acres). STC-1 is located in the near and far east hills of the study area, from the northern border of the study area south to Anderson Reservoir. STC-2 is adjacent to STC-1 in the north and continues south to the southern and eastern boundaries of the study area. The study area supports 150,962 acres of critical habitat, including 2,964 acres of primary habitat and 146,452 acres of secondary habitat (**Table 4-9**). These critical habitat units include both breeding and upland habitats and account for 9% of the designated critical habitat for this species throughout the species' range.

The three primary constituent elements for California red-legged frog are:

1. *Aquatic Breeding Habitat*. Standing bodies of fresh water (with salinities less than 4.5 ppt), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent



water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.

2. *Aquatic Non-Breeding Habitat.* Freshwater pond and stream habitats, as described above, that may not hold water long enough for the species to complete its aquatic life cycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include, but are not limited to: plunge pools within intermittent creeks, seeps, quiet water refugia within streams during high water flows, and springs of sufficient flow to withstand short-term dry periods.
3. *Upland Habitat.* Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mile (1.6 km) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetation types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog.

Impact of covered activity implementation on critical habitat units may occur as a result of rural development, park maintenance and new construction activities, and Plan implementation. There is some potential for impacts due to ongoing operations and maintenance activities, particularly in streams, to affect these two units, but permanent changes in land use are anticipated to be minimal. Avoidance and minimization measures described in Chapter 6 will reduce the potential for indirect impacts on critical habitat.

No more than 1,035 acres (less than 1%) of all California red-legged frog critical habitat in the study area will be affected by covered activities in this Plan (**Table 4-9**). The impact analysis does not identify impacts by critical habitat unit; rather, it identifies impacts grouped by all critical habitat present in the study area. However, 99% of all California red-legged frog critical habitat was also mapped as primary or secondary habitat for this Plan. Impacts to primary and secondary habitat are quantified and discussed in Section 4.6.2 *California Tiger Salamander, California Red-legged Frog, Western Pond Turtle*. In addition, **Table 5-21** also describes estimated acreages of California red-legged frog critical habitat that will be preserved within the Reserve System by unit.

## 4.8 Cumulative Effects

As described above, the impacts of covered activities were assessed in the context of existing conditions in the study area. Some activities and projects that are outside the scope of this Plan may nonetheless contribute to cumulative impacts on covered species. An analysis of cumulative effects is not required in an HCP or NCCP. However, we include an analysis here to support the federal Biological Opinion that will conclude the USFWS Section 7 internal consultation process (see Chapter 1 for details). The scope of the cumulative analysis in a Biological Opinion is limited to non-federal actions because federal actions (i.e., any federal project, project with federal funding, or project that requires a federal

permit) will be the subject of future Section 7 consultations in which cumulative impacts can be considered more fully. To support this analysis, the cumulative projects evaluated in this section are limited to non-federal projects that are not covered by the Plan. The EIR/EIS presents a thorough analysis of the cumulative effects of all projects, federal and non-federal, when combined with the effects of the Habitat Plan.

### 4.8.1 Future Potential Development by the City of Gilroy

The Gilroy General Plan (City of Gilroy 2002) designates a number of areas outside the 20-year planning boundary as future areas for development and open space (W. Faus pers. comm.). Policy 2.11 of the Gilroy General Plan designates two areas outside its 20-year planning boundary (the boundary used as the planning limit of urban growth for the purposes of this Plan) as potential areas for future development. These areas are described below.

- The area north of Day Road, west of Santa Teresa Boulevard, and east of the foothills. This area is suitable for long-term residential expansion and related development.
- The area east of U.S. 101 between Buena Vista and Masten Avenue, bordering on the highway. This area is suitable for long-term expansion of highway-oriented commercial development.

Other City policies place further restrictions on where future development may occur. Gilroy General Plan Policy 1.03 states that uses east of U.S. 101 are restricted to industrial and agricultural use except for (1) commercial developments with the majority of the customer base from outside Gilroy, and (2) public and quasi-public facilities. Residential care facilities that meet criteria of Policy 14.05, *Residential Care Facilities for Seniors*, will also be allowed east of U.S. 101. Future development is also identified for the area north of Day Road and west of Santa Teresa Boulevard, east of the foothills, which is an area suitable for long-term residential expansion and related development.

Policy 20.05 designates protected open space areas in conjunction with agricultural lands to create natural buffers, or “greenbelts,” between Gilroy and surrounding communities; in particular, between Gilroy and San Martin to the north. The policy states that if an adequate greenbelt cannot be established in the area north of Masten and Fitzgerald Roads, then the Gilroy land use designations should be amended to include a greenbelt strip in the northern part of Gilroy’s 20-year Planning Area. Masten and Fitzgerald Roads make up the northern boundary of Gilroy’s 20-year plan (the planning limit of urban growth for this Plan) as well as the southern boundary of the unincorporated community of San Martin. Both the requirements of a greenbelt along Masten and Fitzgerald Roads and the proximity to San Martin would greatly reduce the possibility of Gilroy expanding farther than the 20-year planning boundary to the north except as identified in the first bullet above.

Policy 25.01 restricts development in areas where potential danger to the health, safety, and welfare of residents exists unless it can be mitigated to an “acceptable level of risk.” This applies to development in areas subject to flood damage or geological hazard due to location and/or design. Policy 4.06 works together with policy 25.01 to encourage existing agricultural lands in areas subject to natural hazards, such as major flooding or soils with a high water table, to remain in long-term agricultural production where such use exists. Much of the land to the east of Llagas Creek and south of Gilroy falls into this category of potentially hazardous areas. While development is not prohibited in these areas, a great deal of work on existing flood management infrastructure may be required in advance of any further development in these areas.

Permanent and temporary, direct and indirect impacts to Plan covered species could occur as a result of expansion of urban development outside of the planning limits of urban growth for the City of Gilroy. These impacts would be similar to those impacts described above as occurring within the planning limit of urban growth or nearby to Gilroy, but would increase the extent of described impacts beyond that anticipated by this Plan. Species most likely to be affected by the expansion of Gilroy include species that use agricultural and riparian land cover types on the valley floor. This may include California red-legged frog, California tiger salamander, western pond turtle, western burrowing owl, least Bell’s vireo, tricolored blackbird, and San Joaquin kit fox (**Table 3-5**). The only plant covered species that may be affected is Loma Prieta hoita (**Table 3-6**).

## 4.8.2 Ongoing and Routine Agriculture

Ongoing and routine agricultural activities in the study area are not covered by this Plan except for pond maintenance as described in Chapter 2 if project proponents obtain a permit with the local jurisdiction and those activities eligible for and enrolled in the Neighboring Landowner Assurances Program (see Chapter 10, Section 10.2.7 *Assurances for Private Landowners*, for details of this program and what is covered). Under Section 4(d) of the ESA, routine ranching activities located on private or Tribal lands are exempt from the take prohibitions of Section 9 of the ESA (50 CFR 17.43). This exemption applies to both California red-legged frog and California tiger salamander. However, this exemption does not apply to cultivated agriculture. While it is anticipated that the effects of ongoing agricultural activities on covered species will be relatively low, there is the potential for cumulative effects on covered species to accrue. Ongoing ranching operations such as road construction, road maintenance, or intensive livestock grazing may limit or degrade habitat for species such as western pond turtle, California tiger salamander, California red-legged frog, and foothill yellow-legged frog. (However, ranching activities such as pond maintenance and moderate livestock grazing are essential to the long-term survival of some covered species such as California red-legged frog and California tiger salamander.) Rodent control on grazing lands may adversely affect western burrowing owl and California tiger salamander. Pesticide run-off could also reduce water quality. Some ongoing cultivated agricultural activities may limit or degrade foraging habitat for tricolored blackbird and western

burrowing owl. Covered species could be trampled by cattle, and hydrology of an area may also be impacted by a loss of or change to agricultural practices, specifically grazing practices (Pyke and Marty 2005).

### 4.8.3 Use of Existing Roads

As described above, the construction of rural roads, driveways, and access roads covered by this Plan is expected to increase mortality of covered species such as California red-legged frog and California tiger salamander. Continued use of existing rural roads (i.e., those not covered by the Plan) will contribute to a cumulative impact on these species through continued mortality and injury. The magnitude of this cumulative impact is unknown.

### 4.8.4 Landfill or Quarries

Landfills and quarries other than those described in this Plan are not covered activities under this Plan. If such projects are implemented, they would result in the loss of land cover at the site of the project. Due to urban development constraints and siting requirements for such projects, it is likely that construction of a landfill or quarry project would occur outside the valley floor where natural land covers are dominant. The substantial loss of natural land covers would likely affect the covered species of this Plan. At this time, no landfills or quarries other than those described in this Plan are anticipated to be developed in the study area. As such, possible cumulative impacts are unknown.

Permanent and temporary, direct and indirect impacts to Plan covered species could occur as a result of development of landfills or quarries within the study area. Due to the lack of information about where these projects could occur, it is difficult to describe the land cover-types or covered species that may be affected. Any additional loss of un-developed land cover would likely result in direct and indirect impacts to covered species in accordance with **Table 3-5** and **Table 3-6**.

**Table 4-1.** Potential Indirect Adverse Impacts on Covered Species from New Urban and Rural Development and Operation of the Habitat Plan Reserve System

	Lights in New Urban and Rural Areas	Harassment, Disturbance from More People	Harassment or Injury from Additional Pets	More Noise	Increased Vehicle-Related Disturbance and Mortality <sup>1</sup>	Spread of Invasive Exotic Plants or Wildlife	Increased Risk of Wildfire <sup>2</sup>	Increased Runoff of Urban Pollutants/Change in Hydrology	Increased Recreation in Reserves	Enhancement or Restoration Activities <sup>3</sup>	Habitat Plan Monitoring
<b>Location of Impact</b>											
Outside Habitat Plan Reserves	✓	✓	✓	✓	✓	✓	✓	✓ <sup>4</sup>			
Inside Habitat Plan Reserves	✓	✓	✓	✓		✓	✓		✓	✓	✓
Within existing parks/open space		✓	✓	✓	✓	✓	✓		✓	✓	
<b>Covered Species Potentially Affected</b>											
Bay checkerspot butterfly		✓	✓		✓	✓	✓		✓	✓	✓
Tricolored blackbird	✓	✓							✓	✓	✓
Western burrowing owl		✓	✓		✓	✓	✓		✓	✓	✓
Least Bell's vireo	✓	✓	✓	✓				✓		✓	✓
Western pond turtle		✓	✓		✓	✓	✓	✓	✓	✓	✓
California tiger salamander	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
California red-legged frog	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Foothill yellow-legged frog	✓	✓	✓		✓	✓		✓	✓	✓	✓
San Joaquin kit fox	✓			✓	✓		✓		✓	✓	✓
Tiburon Indian paintbrush		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓
Coyote ceanothus		✓	✓		✓	✓			✓ <sup>5</sup>	✓	
Mount Hamilton thistle		✓	✓		✓	✓	✓	✓	✓ <sup>5</sup>	✓	
Santa Clara Valley dudleya		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	
Fragrant fritillary		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓
Loma Prieta hoita		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓
Smooth lessingia		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓
Metcalf Canyon jewelflower		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓
Most beautiful jewelflower		✓	✓		✓	✓	✓		✓ <sup>5</sup>	✓	✓

**Table 4-1. Continued**

Lights in New Urban and Rural Areas	Harassment, Disturbance from More People	Harassment or Injury from Additional Pets	More Noise	Increased Vehicle-Related Disturbance and Mortality <sup>1</sup>	Spread of Invasive Exotic Plants or Wildlife	Increased Risk of Wildfire <sup>2</sup>	Increased Runoff of Urban Pollutants/Change in Hydrology	Increased Recreation in Reserves	Enhancement or Restoration Activities <sup>3</sup>	Habitat Plan Monitoring
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Notes:

- <sup>1</sup> Excludes indirect effects of vehicle emissions, which causes the spread of invasive exotic plants on serpentine grassland.
- <sup>2</sup> Accounts for the increased risk of wildfire from a growing human population and increased access to wildfire-prone areas (i.e., the Reserve System), all of which is expected to increase the frequency of human-caused wildfire ignition. Effects of wildfires and firefighting activities would be direct, including grading, clearing, disking, mowing, irrigation and other fire suppression activities, plus the temporary damage done by the wildfire itself. In some cases, wildfire will be beneficial to many covered species.
- <sup>3</sup> Adverse impacts from restoration activities on covered species are expected to be temporary; long-term effects of restoration and enhancement will be beneficial.
- <sup>4</sup> Impacts from increased runoff of urban development downstream of urban development would be confined to streams and channels and would not likely affect terrestrial covered species.
- <sup>5</sup> Potential impacts if recreational users go off-trail.

**Table 4-2.** Total Allowable Permanent Impacts on Land Cover Types and Natural Communities (acres)

Land Cover Type	Total in Study Area	Estimated Impacts						% of Total in Study Area
		Urban Development	In-Stream Capital Projects	Rural Capital Project	Rural Development	Conservation Strategy Implementation	Total Allowable Impact	
<b>Grassland</b>								
California annual grassland	81,795	421	76	672	700	137	2,006	2.5%
Serpentine bunchgrass grassland	10,308	359	32	104	155	23	550 <sup>1</sup>	5.3%
Serpentine rock outcrop	260	16	0	1	4	1	22	8.5%
Serpentine seep	34	0	0	0	0	0	0.5	1.5%
Rock outcrop	87	0	0	0	0	0	0.5	0.6%
Subtotal Grassland	92,483	796	108	777	860	161	2,579	2.8%
<b>Chaparral &amp; Northern Coastal Scrub</b>								
Northern mixed chaparral/chamise chaparral	23,763	1	4	15	58	7	86	0.4%
Mixed serpentine chaparral	3,712	57	9	32	29	4	131	3.5%
Northern coastal scrub/Diablan sage scrub	10,306	19	26	53	71	8	178	1.7%
Coyote brush scrub	180	0	6	2	2	0	10	5.5%
Subtotal Chaparral & Northern Coastal Scrub	37,960	78	45	102	160	19	404	1.1%
<b>Oak Woodland</b>								
Valley oak woodland	12,895	46	11	62	70	12	201	1.6%
Mixed oak woodland and forest	84,488	610	71	292	411	57	1,441	1.7%
Blue oak woodland	11,160	41	5	25	51	9	131	1.2%
Coast live oak forest and woodland	31,652	316	45	230	230	18	840	2.7%
Foothill pine-oak woodland	10,960	1	3	13	27	2	46	0.4%
Mixed evergreen forest	5,775	0	6	20	22	2	50	0.9%
Subtotal Oak Woodland	156,930	1,014	142	642	810	100	2,709	1.7%
<b>Riparian Forest and Scrub</b>								
Willow riparian forest and scrub	2,544	32	130	16	1	2	180	7.1%
Central California sycamore alluvial woodland	373	0	2	4	1	1	7	1.9%
Mixed riparian forest and woodland	3,766	5	62	31	6	5	109	2.9%
Subtotal Riparian Forest and Scrub	6,682	37	194	50	8	7	296	4.4%

Table 4-2. Continued

Land Cover Type	Total in Study Area	Estimated Impacts						Total Allowable Impact	% of Total in Study Area
		Urban Development	In-Stream Capital Projects	Rural Capital Project	Rural Development	Conservation Strategy Implementation			
<b>Conifer Woodland</b>									
Redwood forest	9,693	0	0	80	28	1	109	1.1%	
Ponderosa pine woodland	419	0	1	0	0	0	0 <sup>1</sup>	0.0%	
Knobcone pine woodland	711	0	0	5	3	1	8	1.1%	
Subtotal Conifer Woodland	10,823	0	1	84	31	2	117	1.1%	
<b>Wetland</b>									
Coastal and valley freshwater marsh	381	18	8	5	3	0	25 <sup>1</sup>	6.6%	
Seasonal wetland	201	16	0	0	5	0	15 <sup>1</sup>	7.4%	
Subtotal Wetland	583	34	8	5	7	0	40	6.9%	
<b>Aquatic</b>									
Pond	1,110	40	5	0	6	1	52	4.7%	
Riverine (miles)	2,391.5	0 <sup>2</sup>	7.1	1.9	0.4	0.0	9.4	0.4%	
Subtotal Aquatic (acres)	1,110	40	5	0	6	1	52	4.7%	
<b>Agricultural</b>									
Orchard	2,697	492	5	59	69	0	625	23.2%	
Vineyard	1,393	0	0	2	34	0	37	2.6%	
Grain, row-crop, hay and pasture, disked/ short-term fallowed	33,648	6,220	95	261	766	14	7,356	21.9%	
Subtotal Agricultural	37,738	6,711	100	322	870	14	8,018	21.2%	
<b>Developed</b>									
Rural residential	12,414	1,207	30	103	261	2	1,603	12.9%	
Golf courses / Urban parks	8,673	1,989	47	16	43	0	2,095	24.2%	
Ornamental woodland	95	25	1	3	1	0	30	31.3%	
Barren	211	0	18	5	9	0	32	15.2%	
Subtotal Developed	21,392	3,221	95	127	314	2	3,759	17.6%	
TOTAL	365,701	11,931	699	2,110	3,067	307	17,975	4.9%	

<sup>1</sup> A maximum allowed impact is set for this land cover type that is lower than the total estimated impacts to ensure regulatory standards are met. Estimated impacts do not sum to the total allowable impact.

<sup>2</sup> Stream impacts occurring inside the planning limits of urban growth are included in the In-Stream Capital Projects category.



**Table 4-3.** Total Allowable Temporary Impacts on Land Cover Types and Natural Communities (acres)<sup>a</sup>

Land Cover Type	Total in Study Area	Estimated Impacts					
		In-stream Capital Project Construction	In-stream O&M	Rural Capital Project Construction	Rural O&M	Total Allowable Impact	% of Total in Study Area
<b>Grassland</b>							
California annual grassland	81,795	46	0	158	267	574	0.7%
Serpentine bunchgrass grassland	10,308	23	14	6	23	91	0.9%
Serpentine rock outcrop	260	0	0	0	0	2	0.6%
Serpentine seep	34	0	0	0	0	0.4	1.3%
Rock outcrop	87	0	0	0	0	0.2	0.2%
Subtotal Grassland	92,483	68	14	164	291	667	0.7%
<b>Chaparral &amp; Northern Coastal Scrub</b>							
Northern mixed chaparral/chamise chaparral	23,763	5	0	2	16	31	0.1%
Mixed serpentine chaparral	3,712	10	0	3	12	30	0.8%
Northern coastal scrub/Diablan sage scrub	10,306	31	0	7	19	66	0.6%
Coyote brush scrub	180	4	0	5	0	10	5.4%
Subtotal Chaparral & Northern Coastal Scrub	37,960	50	0	17	48	136	0.4%
<b>Oak Woodland</b>							
Valley oak woodland	12,895	8	0	7	16	45	0.3%
Mixed oak woodland and forest	84,488	63	0	39	136	302	0.4%
Blue oak woodland	11,160	5	0	7	16	39	0.3%
Coast live oak forest and woodland	31,652	33	0	36	91	181	0.6%
Foothill pine-oak woodland	10,960	5	0	3	16	26	0.2%
Mixed evergreen forest	5,775	6	0	2	15	25	0.4%
Subtotal Oak Woodland	156,930	120	0	94	290	618	0.4%
<b>Riparian Forest and Scrub</b>							
Willow riparian forest and scrub	2,544	62	26	6	6	103	4.0%
Central California sycamore alluvial woodland	373	0	0	0	4	6	1.6%
Mixed riparian forest and woodland	3,766	39	27	8	22	101	2.7%
Subtotal Riparian Forest and Scrub	6,682	101	54	14	32	209	3.1%

Table 4-3. Continued

Land Cover Type	Total in Study Area	Estimated Impacts				Total Allowable Impact	% of Total in Study Area
		In-stream Capital Project Construction	In-stream O&M	Rural Capital Project Construction	Rural O&M		
<b>Conifer Woodland</b>							
Redwood forest	9,693	0	0	8	47	56	0.6%
Ponderosa pine woodland	419	1	0	0	0	1	0.3%
Knobcone pine woodland	711	0	0	0	0	2	0.3%
Subtotal Conifer Woodland	10,823	1	0	8	48	59	0.5%
<b>Wetland</b>							
Coastal and valley freshwater marsh	381	6	0	1	0	7	1.9%
Seasonal wetland	201	0	0	0	1	2	0.8%
Subtotal Wetland	583	6	0	1	2	9	1.5%
<b>Aquatic</b>							
Pond	1,110	5	0	0	3	9	0.8%
Riverine (miles)	2,391.5	44.7	1.5	1.5	0.1	48.0	2.0%
Subtotal Aquatic (acres)	1,110	5	0	0	3	9	0.8%
<b>Agricultural</b>							
Orchard	2,697	13	0	10	2	24	0.9%
Vineyard	1,393	0	0	1	1	3	0.2%
Grain, row-crop, hay and pasture, disked/ short-term	33,648	63	0	163	42	284	0.8%
Subtotal Agricultural	37,738	76	0	174	45	311	0.8%
<b>Developed</b>							
Rural residential	12,414	35	0	50	51	139	1.1%
Golf courses / Urban parks	8,673	15	0	4	21	40	0.5%
Ornamental woodland	95	1	0	6	1	8	8.2%
Barren	211	1	0	13	0	15	7.0%
Subtotal Developed	21,392	52	0	73	74	201	0.9%
<b>TOTAL</b>	<b>365,701</b>	<b>481</b>	<b>69</b>	<b>545</b>	<b>832</b>	<b>2,219</b>	<b>0.6%</b>

Notes:

Temporary impacts shown for operation and maintenance activities are annual impacts. Construction impacts are one-time impacts.

**Table 4-4.** Maximum Allowable Permanent and Temporary Impacts to Covered Species Modeled Habitat

Species and Habitat Type <sup>1</sup>	Total Modeled Habitat <sup>2</sup> in Study Area (acres)	Maximum Allowable Permanent Impact to Modeled Habitat from Covered Activities (acres)	Proportion (%)	Maximum Allowable Temporary Impact to Modeled Habitat from Covered Activities (acres)	Proportion (%)
<b>Bay Checkerspot Butterfly</b>					
Primary Habitat	8,621	300 <sup>3, 4</sup>	3%	54	<1%
<b>California Tiger Salamander</b>					
Breeding Habitat	1,027	77	7%	14	1%
Non-Breeding Habitat	323,721	12,855	4%	1,529	<1%
Total	324,748	12,932	4%	1,543	<1%
<b>California Red-Legged Frog</b>					
Primary Habitat	10,101	299	3%	116	1%
Secondary Habitat	331,672	12,937	4%	1,489	<1%
Total	341,773	13,236	4%	1,605	<1%
<b>Foothill Yellow-Legged Frog (length in miles)</b>					
Primary Habitat	244	1.9	<1%	0.7	<1%
Secondary Habitat	447	4.8	1%	1.3	<1%
Total	690	6.7	1%	2.0	<1%
<b>Western Pond Turtle</b>					
Primary Habitat	82,895	1,824	2%	440	<1%
Secondary Habitat	232,021	7,825	3%	986	<1%
Total	314,916	9,649	3%	1,426	<1%
<b>Western Burrowing Owl<sup>5</sup></b>					
Occupied Nesting Habitat	1,348	198	15%	20	<1%
Potential Nesting Habitat	63,751	4,000	6%	604	<1%
Overwintering Habitat	132,770	9,671	7%	762	<1%
Total	197,869	13,869	7%	1,385	<1%
<b>Least Bell's Vireo</b>					
Primary Habitat	3,097	72	2%	43	1%
<b>San Joaquin Kit Fox</b>					
Secondary Habitat	38,543	198	<1%	46	<1%
Secondary Habitat (Low Use)	2,349	28	1%	6	<1%
Total	40,892	226	<1%	52	<1%
<b>Tricolored Blackbird</b>					
Primary Habitat	7,933	276	3%	93	1%
Secondary Habitat	132,358	10,317	8%	768	<1%
Total	140,291	10,593	8%	861	<1%

Species and Habitat Type <sup>1</sup>	Total Modeled Habitat <sup>2</sup> in Study Area (acres)	Maximum Allowable Permanent Impact to Modeled Habitat from Covered Activities (acres)	Proportion (%)	Maximum Allowable Temporary Impact to Modeled Habitat from Covered Activities (acres)	Proportion (%)
<b>Mt. Hamilton Thistle</b>					
Primary Habitat	487	26	5%	4	<1%
<b>Fragrant Fritillary</b>					
Primary Habitat	8,820	550 <sup>3</sup>	6%	59	<1%
Secondary Habitat	156,635	2,729	2%	655	<1%
Total	165,455	3,279	2%	714	<1%
<b>Loma Prieta Hoita</b>					
Primary Habitat	104,126	2,117	2%	413	<1%
Secondary Habitat	17,745	266	1%	60	<1%
Total	121,871	2,383	2%	473	<1%
<b>Smooth Lessingia</b>					
Primary Habitat	10,491	550 <sup>3</sup>	5%	68	<1%
<b>Metcalf Canyon Jewelflower</b>					
Primary Habitat	8,105	550 <sup>3</sup>	7%	62	<1%
<b>Most Beautiful Jewelflower</b>					
Primary Habitat	14,277	550 <sup>3</sup>	4%	92	<1%
Secondary Habitat	85	0	0%	0	<1%
Total	14,362	550	4%	92	<1%

## Notes:

<sup>1</sup> Includes species for which habitat distribution models were developed. For other covered species, see the text.

<sup>2</sup> Habitat as shown in Appendix D habitat distribution models.

<sup>3</sup> Allowable impacts to Bay checkerspot butterfly, fragrant fritillary, smooth lessingia, Metcalf Canyon jewelflower, and most beautiful jewelflower are capped below the estimated impacts to account for the caps on serpentine grassland (see Table 4-2) and Bay checkerspot butterfly habitat. These acreages are caps, not estimates.

<sup>4</sup> This cap does not apply to Bay checkerspot butterfly habitat units mapped as “historic/unoccupied” and “occupancy unknown.”

<sup>5</sup> Western burrowing owl modeled habitat includes occupied and potential nesting habitat only in the study area.

**Table 4-5a. In-Stream Capital Improvement Project Permanent Impact Estimation Methods and Key Assumptions**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>San José<sup>4</sup></b>		
New and existing bridge (re)construction	<ul style="list-style-type: none"> <li>Determine total acres of expanded area on existing bridges</li> <li>Determine total acres of new proposed bridges</li> <li>Combine acres of expanded bridge with acres of new bridge</li> <li>Distribute acres across the three riparian land covers in proportion to those land covers occurrence in San José city limits</li> <li>Estimate stream impacts by identifying the total new width (bridge dimension parallel to stream bed) of expanded and new bridges in feet</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on list of bridges provided by City of San José that will be built or reconstructed within the permit term. This list included bridge width and length for each existing, expanded, and new proposed bridge</li> <li>The list of bridges for City of San José includes the bridges that are likely to receive funding for replacement and/or rehabilitation within the 50-year permit term (J. Hart pers. comm. b)</li> <li>New permanent impact to land cover and streams is assumed only for new or expanded areas, not total footprint of all bridges as permanent impacts are assumed to have already taken place for existing infrastructure</li> <li>This method likely over estimates riparian impacts as it assumes that all new bridge area will remove riparian vegetation. It is likely that some new bridge locations will not have existing riparian vegetation</li> <li>Stream impacts assume that new bridge width is directly related to linear stream ft and that stream length covered by new or expanded bridge is permanently impacted</li> </ul>
New trails	<ul style="list-style-type: none"> <li>Identify all proposed new trails in GIS layer</li> <li>In GIS, overlay trails on the land cover layer and apply a 16-foot buffer</li> <li>Exclude all land covers from the results except the riparian land covers as impacts to all other land cover are already assumed in the urban development impact analysis</li> <li>Estimate stream impacts using GIS to calculate the number of new stream crossings made by new trails</li> <li>Multiply number of new stream crossings by 16-foot width to determine total linear ft of stream impacted</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on a GIS trails layer provided by City of San José</li> <li>Assume a width of 16 feet (12 feet for the trail and two 2-foot compact gravel shoulders) (J. Hart pers. comm. a)</li> <li>Assume 100% of impacts resulting from overlay are permanent</li> <li>Existing trails are not assumed to be widened if reconstructed during the permit term</li> <li>Stream crossings of trails assumed to be 16 feet wide</li> </ul>
Cherry Flat dam seismic safety retrofit, including borrow site(s)	<ul style="list-style-type: none"> <li>Develop footprint of project based on existing dam footprint from aerial photos</li> <li>Overlay footprint on land cover layer in GIS</li> <li>Assess impacts to land cover types, including streams</li> </ul>	<ul style="list-style-type: none"> <li>That borrow site(s) will be approximately scaled to the size of the reservoir and dam when compared to County Parks dams, reservoirs, and borrow site size</li> </ul>
<b>Morgan Hill<sup>4</sup></b>		
Bridge expansion	No impacts assessed	<ul style="list-style-type: none"> <li>No expansion of existing bridges is assumed and therefore no new permanent land cover or stream impacts are assumed</li> </ul>

**Table 4-5a. Continued**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
New bridge construction	No impacts assessed	<ul style="list-style-type: none"> <li>No new vehicular bridge construction is assumed for Morgan Hill; pedestrian and trail bridge impacts are assumed under the New Trails covered activity</li> </ul>
New trails	<ul style="list-style-type: none"> <li>Identify trail bridges using GIS</li> <li>Apply a 15-foot buffer to each trail where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers and linear ft of stream</li> </ul>	<ul style="list-style-type: none"> <li>Impacts based on an AutoCAD file provided by City of Morgan Hill (S. Golden pers. comm.); AutoCAD files were imported into GIS</li> <li>It is assumed that all trails in the AutoCAD data are new trails</li> <li>Impacts are assumed to occur in the area encompassed by a 15-foot buffer (30-foot width) along all linear infrastructure identified in the AutoCAD files provided by Morgan Hill (City of Morgan Hill recommended a buffer of 10–20 feet and the middle value of 15 feet was used) (S. Golden pers. comm.)</li> </ul>
Storm drains	No impacts assessed	<ul style="list-style-type: none"> <li>No impacts to streams from implementation of storm drain infrastructure are assumed; All crossings will be jack and bore (beneath the streambed) (J. Behzad pers. comm.)</li> </ul>
<b>Gilroy<sup>4</sup></b>		
Bridge expansion	<ul style="list-style-type: none"> <li>Utilize data provided by the City of Gilroy to calculate the area of each expanded bridge</li> <li>Distribute acres of expanded bridge to riparian land cover types proportional to occurrence in Gilroy</li> <li>Add all bridge expansion widths together to calculate linear feet of stream impacts</li> </ul>	<ul style="list-style-type: none"> <li>Bridge count, including length and width for planned bridge widening, was provided by the City of Gilroy for planned and existing bridges (K. Abrams pers. comm.)</li> </ul>
New bridge construction	<ul style="list-style-type: none"> <li>Utilize data provided by the City of Gilroy to calculate the area of each new bridge</li> <li>Distribute acres of new bridge to riparian land cover types proportional to occurrence in Gilroy</li> <li>Add all new bridge widths together to calculate linear feet of stream impacts</li> </ul>	<ul style="list-style-type: none"> <li>Bridge count, including length and width for planned new bridges, was provided by the City of Gilroy for planned and existing bridges (K. Abrams pers. comm.)</li> </ul>
New trails	<ul style="list-style-type: none"> <li>Identify location of new trails using GIS</li> <li>Apply a 15-foot buffer the mapped facility boundary where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers and linear ft of stream</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on AutoCAD files provided by Gilroy of current master plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Impacts are assumed to occur in the area encompassed by a 15-foot buffer (30-foot width) along all linear infrastructure identified in the AutoCAD files; this assumption is consistent with the assumptions used for Morgan Hill</li> </ul>

Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Sewer improvements	<ul style="list-style-type: none"> <li>Identify location of sewer improvements using GIS</li> <li>Apply a 15-foot buffer the mapped facility boundary where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers</li> </ul>	<ul style="list-style-type: none"> <li>Impact consideration is based on AutoCAD files provided by Gilroy of current master plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Sewer improvement projects are assumed to avoid streams and not result in permanent stream impacts; a small amount of riparian vegetation may be affected; this is consistent with the guidance provided in the Water Collaborative Guidelines and Standards</li> </ul>
New recycled water pipes	<ul style="list-style-type: none"> <li>Identify location of new recycled water pipes using GIS</li> <li>Apply a 15-foot buffer the mapped facility boundary where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers</li> </ul>	<ul style="list-style-type: none"> <li>Impact consideration is based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Recycled water pipe projects are assumed to avoid streams and not result in permanent stream impacts; a small amount of riparian vegetation may be affected; this is consistent with the guidance provided in the Water Collaborative Guidelines and Standards</li> </ul>
Water improvements	<ul style="list-style-type: none"> <li>Identify location of water improvements using GIS</li> <li>Apply a 15-foot buffer the mapped facility boundary where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers</li> </ul>	<ul style="list-style-type: none"> <li>Impact consideration is based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Water improvement projects are assumed to avoid streams and not result in permanent stream impacts; a small amount of riparian vegetation may be affected; this is consistent with the guidance provided in the Water Collaborative Guidelines and Standards</li> </ul>
<b>SCVWD</b>		
Dam Maintenance Program	<ul style="list-style-type: none"> <li>In GIS, overlay the Area of Routine Maintenance footprint on the land cover layer and assess acres of land cover impacted</li> <li>In GIS, overlay the Area of Routine Maintenance and the Area of Potential Effect on the land cover layer</li> <li>Assess acres of land cover within the Area of Potential Effect but outside of the Area of Routine Maintenance</li> <li>Take 15% of the acres identified in the above bullet, proportional to the occurrence of each land cover type identified</li> <li>Add the land cover identified in the first bullet to the land cover identified in the fourth bullet together to identify total impacts</li> </ul>	<ul style="list-style-type: none"> <li>GIS footprint of Dam Maintenance Program project extent was provided by SCVWD</li> <li>SCVWD Dam Maintenance Program GIS data identifies the zone in which 85% of all impacts are expected to occur (also called the <i>Area of Routine Maintenance</i>); this area is assumed to experience permanent impact</li> <li>The remaining 15% of impacts would occur within the Area of Potential Effect; the Area of Potential Effect includes the Area of Routine Maintenance but is somewhat larger than the Area of Routine Maintenance</li> <li>Although this is a maintenance program, implementation of the Dam Maintenance Program results in a permanent clearing of all vegetation from the dam face and surrounding areas; therefore, this is considered a permanent impact to land covers (excluding riverine/streams) and is assessed under In-stream CIP</li> <li>Streams are not assumed to be permanently impacted due to implementation of the Dam Maintenance Program</li> </ul>

**Table 4-5a.** Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Dam safety retrofit footprint	<ul style="list-style-type: none"> <li>• Overlay GIS footprints of “Area A” on land cover layer AND on Dam Maintenance Program footprints</li> <li>• Assess acres of land cover impacted Area A excluding any areas that overlap with the Dam Maintenance Program footprints</li> <li>• Integrate stream impact lengths provided by SCVWD</li> </ul>	<ul style="list-style-type: none"> <li>• Because permanent impacts to land cover were fully assumed for the Dam Maintenance Program, additional impacts to land cover in this zone are not assessed under safety retrofit</li> <li>• SCVWD provided safety retrofit footprints for all dams; this data identifies the footprint of the new dam (Area A), and the area affected by construction impacts (Area B); these footprints assume worst case dam reconstruction of downstream embankment strengthening</li> <li>• All land cover types, including streams, falling within the footprint are assumed to be lost</li> <li>• SCVWD provided stream impact numbers</li> <li>• Safety retrofit of Coyote, Chesbro, and Uvas Dams is not a covered activity under this Plan</li> </ul>
Safety retrofit borrow sites	<ul style="list-style-type: none"> <li>• Use the total acres of borrow site impacts as calculated in the draft Three Creeks HCP (April 2009) for Anderson, Almaden, Calero, and Guadalupe dam borrow sites</li> <li>• Identify the acres of each land cover type present within a 5-mile radius of each of the four dams</li> <li>• For each dam, distribute the total acres of borrow site impact proportionally across the land cover types within a 5-mile radius of the dam</li> </ul>	<ul style="list-style-type: none"> <li>• Acres required for safety retrofits covered by the draft Three Creeks HCP (April 2009) were used as the basis of this analysis</li> <li>• That borrow will be acquired within a 5 mile radius of the dam</li> <li>• This analysis does not account for avoidance of certain land cover types based on the siting criteria in Chapter 2; impacts to certain land cover types may be overestimated while others are underestimated</li> </ul>
Temporary supplemental water supply systems during reservoir drawdown	No impacts assessed	<ul style="list-style-type: none"> <li>• That impacts associated with this activity will be entirely contained within the footprints of the Dam Maintenance Program, the water utility / water supply operations and maintenance impacts, or within existing roads and other disturbed areas</li> </ul>
Water utility / water supply operation and maintenance	<ul style="list-style-type: none"> <li>• Determine permanent impacts as defined in the draft Three Creeks HCP (April 2009) impact analysis for the Coyote and Guadalupe watersheds (Stevens Creek numbers were excluded)</li> <li>• Divide this number by the number of dams in the study area in north County (six dams)</li> <li>• Multiply this number by the number of dams in south County (2 dams)</li> <li>• Distribute 0.4 acre of permanent impact to land cover types proportional to impact for other impacts in this activity</li> </ul>	<ul style="list-style-type: none"> <li>• The draft Three Creeks HCP (April 2009) identifies permanent impacts for operations and maintenance activities in the north County; these impacts were used for this Plan directly for north County impacts and indirectly to derive estimates for impacts associated with activities in south County</li> <li>• In addition to these estimates, some new access roads and facility pads may be required; assume up to 1,600 sq ft per new facility and up to 10 new facilities (0.4 acre); distribute impacts to land cover types proportional to other impacts in this category</li> <li>• That impacts in south County are proportional to impacts in north County based on the number of dams</li> </ul>



Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Lower Llagas vegetation management	<ul style="list-style-type: none"> <li>Using an aerial map for guidance, draw a polygon in GIS around the full extent of the project area including the outer edge of the channel levee as appropriate</li> <li>Overlay GIS polygon on land cover layer</li> <li>Assess total acres of land cover and streams impacted</li> <li>Reduce impacts by 50% for each land cover type</li> <li>Reduce impacts by 95% for permanent stream impacts</li> </ul>	<ul style="list-style-type: none"> <li>50% of existing vegetation will be removed and this reach permanently maintained in this state for flood protection purposes, resulting in a 50% permanent impact</li> <li>The stream may experience some degradation to habitat due to removal of large woody debris and other in-channel vegetation due to flood protection management needs; this amount of degradation is estimated as a permanent impact to 5% of the total stream length</li> </ul>
Canal reconstruction or realignment	<ul style="list-style-type: none"> <li>Using an aerial map for guidance, draw a polygon around the extent of each canal including access roads adjacent to the canal</li> <li>Overlay GIS polygons on land cover layer</li> <li>Assess total acres of land cover impacted</li> </ul>	<ul style="list-style-type: none"> <li>Canals will be dry when they are reconstructed and no stream impacts are anticipated</li> <li>Decommissioning of canals would result in reduced permanent impacts compared to reconstruction or realignment; this analysis assumes the highest level of impacts as associated with reconstruction or realignment</li> </ul>
Flood protection projects (collective)	<ul style="list-style-type: none"> <li>Using an aerial map for guidance, draw a polygon in GIS around the full extent of the project area including the outer edge of the channel levee as appropriate</li> <li>Overlay GIS polygon on land cover layer</li> <li>Assess total acres of land cover and streams impacted</li> <li>Reduce impacts by 80% for each land cover type</li> <li>Reduce impacts by 95% for permanent stream impacts</li> <li>Reduce final impacts by approximately one-third to account for cap on total flood protection projects covered by the Plan</li> </ul>	<ul style="list-style-type: none"> <li>That 20% of existing vegetation, on average, will be removed and permanently due to construction of flood control projects; this assumption is based on engineer drawings from past and current projects, and SCVWD professional experience in implementing flood control projects; this assumption is also based on implementation of the Clean, Safe, Creeks Program by which SCVWD protects and maintains as much natural structure of a stream system as possible</li> <li>Project footprint impacts were based on a polygon footprint from the outer edge of the existing channel or levee</li> <li>Total length of flood protection projects covered by the Plan is capped at 64 miles, with a maximum of 3.1 miles of permanent stream impacts</li> <li>The assumption that only 5% of the total stream length will be permanently impacts is based on: <ul style="list-style-type: none"> <li>review of past and planned projects;</li> <li>the understanding that SCVWD is committed to designing flood control projects to incorporate and support natural stream function and riparian habitat;</li> <li>development and adoption of the Clean, Safe Creeks and Natural Flood Protection Plan program to support the above commitment;</li> <li>examples of planned flood control projects that seek to remove existing development and replace it with a wider and more natural channel (Upper Penitencia project) and that may result in net benefit for habitat; and</li> <li>the understanding that conditions identified in the Habitat Plan (Condition 4) will be utilized and incorporated into project design and</li> </ul> </li> </ul>

Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
		construction o Feedback from SCVWD engineers (D. Arnold pers. comm. a)
Levee reconstruction projects (collective)	<ul style="list-style-type: none"> <li>Using an aerial map for guidance, draw a polygon in GIS around the full extent of each individual levee (i.e., a channel with a levee on each side would require two separate polygons) including the outer edge of the channel levee as appropriate</li> <li>Import GIS levee layer and combine with levees mapped from the aerial photo</li> <li>Overlay GIS polygons on land cover layer</li> <li>Assess total acres of land cover impacted</li> <li>Reduce impacts by 95% for permanent stream impacts</li> <li>Divide all resulting impacts (land cover and stream) by one-half to account for 10 mile impact cap</li> </ul>	<ul style="list-style-type: none"> <li>Includes all reconstruction activities including improvements and expanded levees (taller or wider levees)</li> <li>SCVWD provided aerial images marking the extent of levee location (D. Arnold pers. comm. b); SCVWD also provided a GIS layer for SCVWD levees; levees identified in both data sources were utilized for this analysis</li> <li>Assumes levees will be reconstructed within the same footprint as in aerial photos and in GIS; may be a slight under estimation of impacts if levee encroaches into stream bed area due to design constraints</li> <li>Assumes that all vegetation within the footprint will be removed; may be an overestimate as levee reconstruction will not result in a loss of shaded riverine habitat</li> <li>Assumes impacts are capped at 10 miles</li> </ul>
Groundwater recharge ponds	<ul style="list-style-type: none"> <li>Digitize recharge ponds, new diversion dam at Metcalf Road, pipeline to Ford Road pond, and existing diversion outtake at Church Avenue in GIS</li> <li>Overlay GIS polygons on land cover layer</li> <li>Assess total acres of land cover impacted</li> <li>Delete impacts to “ponds” land cover type</li> </ul>	<ul style="list-style-type: none"> <li>SCVWD plans to re-operate Ford Road and Church Avenue groundwater recharge ponds; projects includes rehabilitation of diversion at Church Avenue and construction of a new diversion at Metcalf Road</li> <li>Ford Road project includes installation of a new pipeline from the diversion to the pond</li> <li>SCVWD provided aerial maps showing where the re-operated ponds are located</li> <li>Metcalf Road diversion is assumed to be approximately 200 feet (stream length) by 170 feet (stream width); and that approximately half of this area is riparian vegetation (0.4 acre of riparian)</li> <li>Approximately 80% of the Church Avenue ponds site is currently mapped as ponds land cover type; because ponds will be the land cover type after project implementation, impacts to the ponds land cover type were not included in the impact analysis</li> <li>As SCVWD’s water rights have not changed, no impact to in-stream flow is anticipated</li> </ul>
Alamitos Creek/Almaden Reservoir Fish Passage	<ul style="list-style-type: none"> <li>Digitize in GIS the general area of where the project components may go</li> <li>Distribute 30 acres of impacts proportional to the percentages of land cover in the generally mapped area</li> <li>Assess 50 feet of stream impact</li> </ul>	<ul style="list-style-type: none"> <li>Assume up to 30 acres of impact to land cover types around Almaden Dam and Reservoir</li> <li>Assume up to 50 feet of permanent stream loss</li> </ul>

Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Trails	No impacts assessed	<ul style="list-style-type: none"> <li>Assumes that trail projects are located on existing maintenance roads or as components of flood protection projects; therefore, impacts are assumed to either already have occurred (existing maintenance roads) or that impacts are captured by the impacts assessed for flood protection projects; no additional impacts to land cover are assessed</li> </ul>
<b>County Roads and Airports</b>		
Bridge replacement - expanded footprint	<ul style="list-style-type: none"> <li>Determine total acres of expanded area on existing bridges or acres of new bridges</li> <li>Distribute acres across the three riparian land covers in proportion to those land covers occurrence in the county</li> <li>Estimate stream impacts by identifying the total new width (bridge dimension parallel to stream bed) of expanded and new bridges in feet</li> </ul>	<ul style="list-style-type: none"> <li>Impacts based on data provided by County of Santa Clara Road and Airports containing a list of bridges that will be reconstructed within the permit term; This list includes bridge width and length for each existing bridge (D. Cameron pers. comm. a)</li> <li>County Roads has identified three road connection projects in the study area. One of these projects, Center Avenue extension to Marcella will require a new bridge. Another project, McKean Road connection to Almaden Expressway, may require a new bridge depending on land acquisition constraints (D. Cameron pers. comm. b)</li> <li>Aside from the exceptions noted in the above bullet, County Roads has no plans to build bridges in new locations in the Study area. Any new bridges would be due to land use development and would have to be funded by the developer and impacts are assessed under Rural Development</li> <li>Bridges are assumed to be double in width during reconstruction to account for new safety and seismic codes</li> <li>New permanent impact to land cover and streams is assumed only for new or expanded areas, not total footprint of all bridges as permanent impacts are assumed to have already taken place for existing infrastructure</li> <li>This method likely over estimates riparian impacts as it assumes that all new bridge area will remove riparian vegetation. It is likely that some new bridge locations will not have existing riparian vegetation</li> <li>Stream impacts assume that new bridge width is directly related to linear stream ft and that stream length covered by new or expanded bridge is permanently impacted</li> </ul>

Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>County Parks</b>		
New bridges	<ul style="list-style-type: none"> <li>Calculate the stream miles of existing bridges (i.e., total width of all bridges)</li> <li>Calculate the ratio of existing but unplanned parks to existing but planned and constructed parks</li> <li>Multiple the miles of existing bridges by the ratio calculated in the previous bullet to determine miles of bridges in existing but unplanned parks</li> <li>Calculate the ratio of future park lands to existing park lands</li> <li>Multiple the miles of existing bridges by the ratio calculated in the previous bullet to determine miles of bridges in future parks</li> <li>Add the results of 3<sup>rd</sup> and 5<sup>th</sup> bullets for total new permanent stream impacts</li> </ul>	<ul style="list-style-type: none"> <li>The number of bridges constructed in the future is proportional to the number of bridges currently in existence</li> <li>Analysis only accounts for stream impacts as all other impacts are assessed under Rural CIP</li> </ul>
Dam safety retrofit, including borrow sites	<ul style="list-style-type: none"> <li>Using data provided by County Parks, develop polygons in GIS around dams</li> <li>Overlay on land cover layer to assess impacts to land cover type from dam retrofits</li> <li>Apply acres of impact for borrow sites to California annual grassland land cover type</li> </ul>	<ul style="list-style-type: none"> <li>County Parks provided impact numbers for the dam at Sandywool Lake and the five dams at Grant Lake and for the size of borrow pits required for each dam (D. Rocha pers. comm.)</li> <li>Borrow sites will be located in grasslands</li> </ul>
<b>VTA</b>		
Light-rail bridge reconstruction	<ul style="list-style-type: none"> <li>No impacts assessed</li> </ul>	<ul style="list-style-type: none"> <li>VTA provided a list of eight (8) light rail bridges that are likely to be replaced over the permit term</li> <li>New permanent impact to land cover and streams is assumed only for new or expanded areas, not total footprint as permanent impacts are assumed to have already taken place for existing infrastructure</li> <li>No expansion is assumed for reconstruction of VTA bridges</li> </ul>
S.R. 237 HOV /HOT lane (full length inside the study area)	<ul style="list-style-type: none"> <li>Use GIS to identify number of stream crossings</li> <li>Using aerial photos, identify length and width of existing stream crossings</li> <li>Add 24 ft to width of crossing (linear ft of stream)</li> <li>Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the planning limit of urban growth for the City of San José</li> <li>Assess permanent impacts to streams at 24 feet per crossing</li> </ul>	<ul style="list-style-type: none"> <li>VTA provided project location</li> <li>Full length of project is inside the planning limit of urban growth; no new land cover impacts are assumed because this area was assessed under the Urban Development impact category, with the exception of stream crossings</li> <li>Each stream crossing will require bridge widening of 24 feet</li> <li>New bridge width will affect in-stream riparian and linear feet of stream</li> </ul>

Table 4-5a. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
S.R. 85 HOV/HOT lane (full length inside the study area)	<ul style="list-style-type: none"> <li>• Use GIS to identify number of stream crossings</li> <li>• Using aerial photos, identify length and width of existing stream crossings</li> <li>• Add 24 feet to width of crossing (linear ft of stream)</li> <li>• Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the planning limit of urban growth for the City of San José</li> <li>• Assess permanent impacts to streams at 24 feet per crossing</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided project location</li> <li>• Full length of project is inside the planning limit of urban growth; no new land cover impacts are assumed because this area was assessed under the Urban Development impact category, with the exception of stream crossings</li> <li>• Each stream crossing will require bridge widening of 24 feet</li> <li>• New bridge width will affect in-stream riparian and linear feet of stream</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).

<sup>4</sup> Impacts assessed for cities under the In-Stream impacts category only include impacts to riparian and riverine land cover types as impacts to all other land covers for urban development are assumed under the Urban Development impact analysis assumptions.

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive of all covered activities. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-5b.** In-Stream Capital Improvement Project Construction Temporary Impact Estimation Methods and Key Assumptions

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>San José<sup>4</sup></b>		
New and existing bridge (re)construction	<ul style="list-style-type: none"> <li>• Determine the total length of all existing and planned bridges</li> <li>• Multiply the total length of all existing and planned bridges by a construction width of 30 ft (15 ft buffer<sup>5</sup> on each side of the bridge) to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in San José city limits</li> <li>• Estimate temporary stream impacts by multiplying a 30 ft width of temporary impacts per bridge by the number of bridges to be constructed or reconstructed</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts are based on list of bridges provided by City of San José that will be built or reconstructed within the permit term. This list included bridge width and length for each existing, expanded, and new proposed bridge</li> <li>• The list of bridges for City of San José includes the bridges that are likely to receive funding for replacement and/or rehabilitation within the 50-year permit term (J. Hart pers. comm. b)</li> <li>• Length of bridges is assumed to be bank to bank, perpendicular to flow, and that construction impacts would occur along the full length of the bridge</li> <li>• Temporary construction impacts are assumed to occur within 15 ft upstream and downstream of the bridge crossing, for a total construction width of 30 ft along the linear stream</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> <li>• This method likely over estimates riparian impacts as it assumes impacts will temporarily affect riparian vegetation. It is likely that some bridge locations will not have existing riparian vegetation</li> </ul>
New trails	<ul style="list-style-type: none"> <li>• In GIS, overlay trails on the land cover layer and apply a 4 ft buffer</li> <li>• Exclude all land covers from the results except the riparian land covers as impacts to all other land cover are already assumed in the urban development impact analysis</li> <li>• Estimate stream impacts using GIS to calculate the number of stream crossings (existing and new) by trails</li> <li>• Multiply number of new stream crossings by 8 ft width to determine total linear ft of stream impacted</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts are based on a GIS trails layer provided by City of San José</li> <li>• Assume temporary construction impacts occur in a buffer of 4 ft along each trail (8 ft total width, one-half of trail footprint)</li> </ul>

Table 4-5b. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>Morgan Hill<sup>4</sup></b>		
Bridge replacement and expansion	<ul style="list-style-type: none"> <li>Identify the existing number of bridges using GIS by overlaying the road layer on the stream layer</li> <li>Verify on aerials that bridge locations were accurate from the overlay of roads and streams</li> <li>Apply a 15 ft buffer to each bridge footprint where it crosses the in-stream area</li> <li>Overlay the resulting buffered land cover to determine riparian land covers impacted during bridge replacement</li> </ul>	<ul style="list-style-type: none"> <li>Neither a list of bridges for replacement nor GIS locations of existing bridges were provided; instead, bridges were assumed to occur at locations where roads cross a mapped creek or stream</li> <li>Temporary impacts are assumed to occur within 15 ft upstream and downstream of the bridge crossing, for a total construction width of 30 ft along the linear stream</li> <li>Temporary impacts are not assumed for the area under the existing bridge as that area is assumed to be already permanently impacted</li> </ul>
New bridge construction	No impacts assessed	<ul style="list-style-type: none"> <li>No new vehicular bridge construction is assumed for Morgan Hill; pedestrian and trail bridge impacts are assumed under the New Trails covered activity</li> </ul>
New trails	<ul style="list-style-type: none"> <li>Identify trail bridges using GIS</li> <li>Apply a 5 ft buffer to each trail where it crosses the in-stream area</li> <li>Overlay the resulting buffered area on the land cover layer to determine impacts to riparian land covers and linear ft of stream</li> </ul>	<ul style="list-style-type: none"> <li>Impacts based on an AutoCAD file provided by City of Morgan Hill (S. Golden pers. comm.)</li> <li>Assume a 5 ft buffer (10 ft width); This is equivalent to 1/3 the area of CIP footprint</li> <li>It was assumed that all trails in the AutoCAD data are new trails</li> </ul>
Storm Drainage	No impacts assessed	<ul style="list-style-type: none"> <li>No impacts to streams from implementation of storm drain infrastructure are assumed; All crossings will be jack and bore (beneath the streambed) (J. Behzad pers. comm.)</li> </ul>
<b>Gilroy<sup>4</sup></b>		
Bridge replacement and expansion	<ul style="list-style-type: none"> <li>Identify number of bridge expansion projects based on data provided by the city of Gilroy</li> <li>Identify average length of each bridge widening project</li> <li>Multiply number of bridges by average length by 30 ft (15 ft buffer on either side of expanded bridge) to calculate acres of temporary impact</li> <li>Distribute acres of impact to riparian land cover types proportional to occurrence in Gilroy</li> <li>Estimate temporary stream impacts by multiplying a 30 ft width of temporary impacts per bridge by the number of bridges to be replaced or expanded</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on bridge count, including length and width for planned bridge widening, was provided by the City of Gilroy for planned and existing bridges (K. Abrams pers. comm.)</li> <li>Temporary impacts are assumed to occur within 15 ft upstream and downstream of the bridge crossing, for a total construction width of 30 ft along the linear stream</li> <li>Temporary impacts are not assumed for the area under the existing bridge as that area is assumed to be already permanently impacted</li> </ul>

Table 4-5b. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
New bridge construction	<ul style="list-style-type: none"> <li>Identify number of new bridges based on data provided by the city of Gilroy</li> <li>Identify average length of each new bridge project</li> <li>Multiply number of bridges by average length by 30 ft (15 ft buffer on either side of new bridge) to calculate acres of temporary impact</li> <li>Distribute acres of impact to riparian land cover types proportional to occurrence in Gilroy</li> <li>Estimate temporary stream impacts by multiplying a 30 ft width of temporary impacts per bridge by the number of bridges to be replaced or expanded</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on bridge count, including length and width for planned new bridges, was provided by the City of Gilroy for planned and existing bridges (K. Abrams pers. comm.)</li> <li>Temporary impacts are assumed to occur within 15 ft upstream and downstream of the bridge crossing, for a total construction width of 30 ft along the linear stream</li> </ul>
New trails	<ul style="list-style-type: none"> <li>Multiply permanent impacts identified in permanent in-stream impacts for new trails by one-third</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Assume a 5 ft buffer (10 ft width); This is equivalent to 1/3 the area of CIP footprint</li> <li>Assume that the land covers impacted by construction are the same types and the same proportion as the permanent impacts</li> </ul>
Sewer improvements	<ul style="list-style-type: none"> <li>Multiply permanent impacts identified in permanent in-stream impacts for sewer improvements by one-third</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Assume a 5 ft buffer (10 ft width); This is equivalent to 1/3 the area of CIP footprint</li> <li>Assume that the land covers impacted by construction are the same types and the same proportion as the permanent impacts</li> </ul>
New recycled water pipes	<ul style="list-style-type: none"> <li>Multiply permanent impacts identified in permanent in-stream impacts for recycled water pipes by one-third</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Assume a 5 ft buffer (10 ft width); This is equivalent to 1/3 the area of CIP footprint</li> <li>Assume that the land covers impacted by construction are the same types and the same proportion as the permanent impacts</li> </ul>
Water improvements	<ul style="list-style-type: none"> <li>Multiply impacts identified in permanent in-stream impacts for water improvements by one-third</li> </ul>	<ul style="list-style-type: none"> <li>Impacts are based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>Assume a 5 ft buffer (10 ft width); This is equivalent to 1/3 the area of CIP footprint</li> <li>Assume that the land covers impacted by construction are the same types and the same proportion as the permanent impacts</li> </ul>



Table 4-5b. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>SCVWD</b>		
Dam Maintenance Program	No impacts assessed	<ul style="list-style-type: none"> <li>Because full permanent impacts to land cover were assumed under the In-Stream CIP category, and because this is not a construction projects, no temporary impacts are assessed</li> </ul>
Dam safety retrofit footprint	<ul style="list-style-type: none"> <li>SCVWD provided GIS footprints of estimated extent of safety retrofit for all SCVWD dams</li> <li>Overlay GIS footprints of “Area B” on land cover layer AND on Dam Maintenance Program footprints</li> <li>Assess acres of land cover impacted in Area B excluding any areas that overlap with the Dam Maintenance Program footprints</li> <li>Assess temporary impacts to miles of streams for all length of stream occurring in Area B</li> </ul>	<ul style="list-style-type: none"> <li>SCVWD provided safety retrofit footprints for all covered dams; this data identifies the existing dam face, the footprint of the new dam (Area A), and the area affected by construction impacts (Area B)</li> </ul>
Safety retrofit borrow sites	<ul style="list-style-type: none"> <li>April 2009 draft Three Creeks HCP identified acres of temporary impacts for Anderson, Almaden, Calero, and Guadalupe dam borrow sites</li> <li>Identify the acres of each land cover type present within a 5-mile radius of each of the four dams</li> <li>For each dam, distribute the total acres of temporary impact proportionally across the land cover types within a 5-mile radius of the dam</li> </ul>	<ul style="list-style-type: none"> <li>The April 2009 draft Three Creeks HCP identified acres of temporary impacts</li> <li>Borrow will be acquired within a 5 mile radius of the dam</li> <li>This analysis does not account for avoidance of certain land cover types based on the siting criteria in Chapter 2; impacts to certain land cover types may be overestimated while others are underestimated</li> </ul>
Lower Llagas vegetation management	<ul style="list-style-type: none"> <li>Using GIS, identify stream miles of entire project footprint</li> <li>Assess temporary impacts on 5% of the identified stream miles</li> </ul>	<ul style="list-style-type: none"> <li>Temporary losses of vegetation are assumed to be incorporated in the 50% permanent loss of vegetation assessed under In-Stream CIP; therefore, no temporary impacts are assessed</li> <li>Temporary impacts to streams can largely be avoided by applying the requirements identified in Chapter 6; however, vegetation management activities that require removal of trees, or root wads from the active channel (channel with water) may result in temporary water quality impacts associated with ground disturbance. These impacts are assumed to be very small and are estimated to be 5% of the project length</li> </ul>
Canal reconstruction or realignment	<ul style="list-style-type: none"> <li>Using the GIS footprint developed for In-stream CIP impacts, apply a 10 ft buffer around the project site</li> <li>Assess impacts to land cover in the buffer area only</li> </ul>	<ul style="list-style-type: none"> <li>Temporary impacts are assumed for an average of 10 ft buffer around the project site which is the full extent of the canal</li> <li>Canals are assumed to be dry at the time of construction and therefore no stream impacts are assessed</li> </ul>

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Flood protection projects (collective)	<ul style="list-style-type: none"> <li>Using the polygons developed for In-Stream CIP project footprints, overlay the GIS polygon on the land cover layer</li> <li>Assess total acres of land cover and streams impacted</li> <li>Reduce impacts by 80% for each land cover type</li> <li>Reduce impacts by 50% for temporary stream impacts</li> <li>Reduce final impacts by approximately one-third to account for cap on total flood protection projects covered by the Plan</li> </ul>	<ul style="list-style-type: none"> <li>Temporary impacts to land cover are assumed to be on average 20% of all existing land cover; this represents vegetation that will be impacted during project construction but replaced upon completion of construction</li> <li>Construction impacts were assumed to occur within the same footprint as the project; as such, no buffer was used</li> <li>Total length of flood protection projects covered by the Plan is capped at 64 miles</li> <li>Temporary impacts to streams are assumed to be on average 50% of the total stream miles in the project area; this account for dewatering in portions of the channel and other temporary construction impacts</li> </ul>
Levee reconstruction projects (collective)	<ul style="list-style-type: none"> <li>Using the GIS polygons developed for In-Stream CIP levee project footprints, apply a 20 ft buffer</li> <li>Overlay with the polygon buffer with the land cover layer in GIS</li> <li>Assess total acres of impacts by land cover</li> <li>Using GIS, identify the full length of stream miles associated with each channel that will require levee reconstruction</li> <li>Assess temporary stream impacts along the identified stream miles</li> </ul>	<ul style="list-style-type: none"> <li>Temporary impacts are assumed for an average of 20 ft buffer around the project site which includes the inner (i.e., in-channel) and outer edges of the levee</li> <li>Because this project calls for full levee reconstruction, it is assumed there will be temporary impacts to the entire length of stream in the channel being reconstructed</li> </ul>
Groundwater recharge ponds	<ul style="list-style-type: none"> <li>Digitize temporary impact area in GIS</li> <li>Overlay GIS polygons on land cover layer</li> <li>Assess total acres of land cover temporarily impacted</li> </ul>	<ul style="list-style-type: none"> <li>A perimeter of 10 ft around the outer edge of the Ford Road ponds site and around the Church Avenue diversion site is assumed to be temporarily affected during construction</li> </ul>
Alamitos Creek / Almaden Reservoir Fish Passage	<ul style="list-style-type: none"> <li>Distribute 5 acres of impact proportional to the acres of land cover affected by permanent project impacts</li> <li>Assess 30 ft of temporary stream impact</li> </ul>	<ul style="list-style-type: none"> <li>Assume up to 5 acres of temporary construction impacts to non-stream land cover types may occur and up to 30 ft of temporary stream impacts</li> <li>Construction impacts are distributed proportional to land cover types affected by permanent project impacts</li> </ul>

Table 4-5b. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>County Roads and Airports</b>		
Bridge replacement - expanded footprint	<ul style="list-style-type: none"> <li>• Determine the total length of all existing bridges</li> <li>• Multiply the total length of all existing and planned bridges by a construction width of 32 ft (16 ft buffer on each side of the bridge) to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in Santa Clara unincorporated county</li> <li>• Estimate temporary stream impacts by multiplying a 32 ft width of temporary impacts per bridge by the number of bridges to be reconstructed</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts based on data provided by County of Santa Clara Road and Airports containing a list of bridges that will be reconstructed within the permit term; This list includes bridge width and length for each existing bridge</li> <li>• County Roads plans one new bridge in the study area</li> <li>• Temporary impacts are assumed to occur within 16 ft upstream and downstream of the bridge crossing, for a total construction width of 32 ft along the linear stream (D. Cameron pers. comm.)</li> <li>• This method likely over estimates riparian impacts as it assumes that all bridge construction will remove riparian vegetation. It is likely that some bridge construction will not have existing riparian vegetation</li> </ul>
<b>County Parks</b>		
Existing and New Bridge Construction	<ul style="list-style-type: none"> <li>• Apply ratios of new bridges to existing bridges determined for In-stream CIP permanent impacts to the number of existing bridges to identify numbers and types of future bridges by bridge type</li> <li>• Add results of first bullet to the number of existing bridges to identify total number of existing bridges to be rebuilt and new bridges to be constructed for each type of bridge</li> <li>• Multiple construction buffers by 2 (to get total length of stream temporarily affected during construction) and then multiply by the total number of bridges for each bridge type</li> <li>• Add results of three bridge types together to get total stream miles of temporary construction impacts</li> </ul>	<ul style="list-style-type: none"> <li>• County Parks provided data on total number of existing bridges by bridge type (non-bridge water crossings, large bridges, and small bridges and puncheons), dimensions of each bridge type, and count of existing bridges by type</li> <li>• Assume temporary construction buffers of 2 ft for non-bridge water crossings, 15 ft for large bridges, and 5 ft for small bridges and puncheons</li> <li>• Analysis only accounts for temporary construction stream impacts as all other construction impacts are assessed under Rural CIP</li> </ul>

Table 4-5b. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>VTa</b>		
Light-rail bridges	<ul style="list-style-type: none"> <li>Determine the total length of all existing bridges</li> <li>Multiply the total length of all existing bridges by a construction width of 30 ft (15 ft buffer on each side of the bridge) to identify acres of temporary impact</li> <li>Distribute acres across the three riparian land covers in proportion to those land covers occurrence in San José city limits</li> <li>Estimate temporary stream impacts by multiplying a 30 ft width of temporary impacts per bridge by the number of existing bridges</li> </ul>	<ul style="list-style-type: none"> <li>Impacts based on data provided by VTA regarding location of bridges assumed to be reconstructed over the permit term</li> <li>The average width of each bridge is assumed to be 100 ft and average length 143 ft; these numbers correspond to the average width and length of San José bridges; all VTA bridges are located in San José</li> <li>Temporary impacts are assumed to occur within 15 ft upstream and downstream of the bridge crossing, for a total construction width of 30 ft along the linear stream</li> <li>All eight bridges are located inside of the San José planning limit of urban growth; therefore, only riparian impacts are assessed as all other impacts are assessed under the Urban Development category</li> <li>This method likely over estimates riparian impacts as it assumes impacts will temporarily affect riparian vegetation. It is likely that some bridge locations will not have existing riparian vegetation</li> </ul>
S.R. 237 HOV/HOT lane (full length inside the study area)	<ul style="list-style-type: none"> <li>20 ft of linear stream temporary impact per stream crossing</li> <li>Multiply 20 ft by the length of each crossing as identified under the permanent impact calculations and convert to acres</li> <li>Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the planning limit of urban growth for the City of San José</li> </ul>	<ul style="list-style-type: none"> <li>All construction impacts are assumed to occur on the adjacent freeway or within the median that is being permanently impacted, with the exception of in-stream areas</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> <li>Assume a temporary riparian impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> </ul>
S.R. 85 HOV /HOT lane (full length inside the study area)	<ul style="list-style-type: none"> <li>20 ft of linear stream temporary impact per stream crossing</li> <li>Multiply 20 ft by the length of each crossing as identified under the permanent impact calculations and convert to acres</li> <li>Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the planning limit of urban growth for the City of San José</li> </ul>	<ul style="list-style-type: none"> <li>All construction impacts are assumed to occur on the adjacent freeway or within the median that is being permanently impacted, with the exception of in-stream areas</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> <li>Assume a temporary riparian impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> </ul>

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.		
<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).		
<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).		
<sup>4</sup> Impacts assessed for cities under the In-Stream impacts category only include impacts to riparian and riverine land cover types as impacts to all other land covers for urban development are assumed under the Urban Development impact analysis assumptions.		
<sup>5</sup> Buffers described for temporary impacts identify the area immediately surrounding the footprint of the associated project where temporary impacts are assumed to occur. Temporary impact buffers are in addition to buffers assumed to represent the project footprint as described in Table 4-5a.		
<b>Note:</b> This table of impact analysis methods and key assumptions is not intended to be all inclusive of all covered activities. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.		

**Table 4-5c.** In-Stream Operations and Maintenance Temporary Impact Estimation Methods and Key Assumptions

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>San José</b>		
New and existing bridge maintenance	<ul style="list-style-type: none"> <li>• Determine the total length of all existing and planned bridges</li> <li>• Multiply the total length of all existing and planned bridges by a maintenance width of 24 ft (12 ft buffer on each side of the bridge) and convert to acres to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in San José city limits</li> <li>• Estimate temporary stream impacts by multiplying the maintenance buffer zone (24 ft) by the number of bridges to be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts are based on list of bridges provided by City of San José that will be built or reconstructed within the permit term. This list included bridge width and length for each existing, expanded, and new proposed bridge; average length is 143 ft and average width is 100 ft</li> <li>• The list of bridges for City of San José includes the bridges that are likely to receive funding for replacement and/or rehabilitation within the 50-year permit term (J. Hart pers. comm. b)</li> <li>• Temporary land cover and stream impacts are assumed to occur within 12 ft upstream and downstream of the bridge crossing, for a total maintenance width of 24 ft along the linear stream; this assumption is based on County Roads maintenance buffers</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> <li>• This method likely over estimates riparian impacts as it assumes all impacts will temporarily affect riparian vegetation. It is likely that some bridge locations will not have existing riparian vegetation</li> </ul>
New and existing trail maintenance	<ul style="list-style-type: none"> <li>• In GIS, overlay trail layer provided by San José on the land cover layer</li> <li>• Apply a 4 ft buffer</li> <li>• Exclude all land covers from the results except the riparian land covers as impacts to all other land cover are already assumed in the urban development impact analysis</li> <li>• Estimate stream impacts using GIS to calculate the number of trail stream crossings (existing and new)</li> <li>• Multiply number of stream crossings by 8 ft width to determine total linear feet of stream impacted</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts are based on a GIS trails layer provided by City of San José</li> <li>• Temporary land cover and stream impacts in urban areas are assumed to occur within 4 ft upstream and downstream of the bridge crossing, for a total maintenance width of 8 ft along the linear stream</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> <li>• This analysis only attempts to capture trail impacts in in-stream areas; impacts in upland areas are identified in the Urban Development impact category</li> </ul>

Table 4-5c. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>Morgan Hill</b>		
Bridge maintenance	<ul style="list-style-type: none"> <li>Identify the existing number of bridges using GIS by overlaying the road layer on the stream layer</li> <li>Verify on aerials that bridge locations were accurate from the overlay of roads and streams</li> <li>Apply a 12ft buffer to each bridge footprint where it crosses the in-stream area</li> <li>Overlay the resulting buffered land cover to determine riparian land covers impacted</li> </ul>	<ul style="list-style-type: none"> <li>Bridges were assumed to occur at locations where roads cross a mapped creek or stream; 6 bridges were identified in Morgan Hill.</li> <li>Temporary land cover and stream impacts are assumed to occur within 12 ft upstream and downstream of the bridge crossing, for a total maintenance width of 24 ft along the linear stream; this assumption is based on County Roads maintenance buffers</li> <li>Temporary impacts are not assumed for the area under the bridge (60 ft by 100 ft) as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> <li>This analysis only attempts to capture trail impacts in in-stream areas; impacts in upland areas are identified in the Rural Operations and Maintenance impacts category</li> </ul>
Trail maintenance	<ul style="list-style-type: none"> <li>In GIS, overlay trail layer provided by Morgan Hill on the land cover layer</li> <li>Apply a 4 ft buffer</li> <li>Exclude all land covers from the results except the riparian land covers as impacts to all other land cover are already assumed in the urban development impact analysis</li> <li>Estimate stream impacts using GIS to calculate the number of trail stream crossings (existing and new)</li> <li>Multiply number of stream crossings by 8 ft width to determine total linear feet of stream impacted</li> </ul>	<ul style="list-style-type: none"> <li>10 trail stream crossings are assumed</li> <li>Temporary land cover and stream impacts in urban areas are assumed to occur within 4 ft upstream and downstream of the bridge crossing, for a total maintenance width of 8 ft along the linear stream</li> <li>Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> <li>This analysis only attempts to capture trail impacts in in-stream areas; impacts in upland areas are identified in the Urban Development impact category</li> </ul>
<b>Gilroy</b>		
Bridge maintenance	<ul style="list-style-type: none"> <li>Determine the average length of all planned new and widened bridges</li> <li>Multiply the average length of all planned bridges by a maintenance width of 24 ft (12 ft buffer on each side of the bridge) and convert to acres to identify acres of temporary impact</li> <li>Distribute acres across the three riparian land-cover types in proportion to those land covers occurrence in Gilroy city limits</li> <li>Estimate temporary stream impacts by multiplying the maintenance buffer (24 ft) by the number of bridges to be maintained</li> </ul>	<ul style="list-style-type: none"> <li>Bridge count, including length and width for new and widened bridges, was provided by the City of Gilroy for planned and existing bridges (K. Abrams pers. comm.)</li> <li>Gilroy is assumed to have 32 planned and existing bridges</li> <li>Existing bridges are assumed to have the same average width and length as new and widened bridges</li> <li>Temporary land cover and stream impacts are assumed to occur within 12 ft upstream and downstream of the bridge crossing, for a total maintenance width of 24 ft along the linear stream; this assumption is based on County Roads maintenance buffers</li> <li>Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> </ul>

Table 4-5c. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Trail maintenance	<ul style="list-style-type: none"> <li>• In GIS, calculate total ft of trails that occur in the in-stream area</li> <li>• Apply a 4 ft buffer on each side of the trail and overlay on land cover data</li> <li>• Assess impacts to acres of land cover</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts are based on AutoCAD files provided by Gilroy of current Master Plans for infrastructure development; AutoCAD files were imported into GIS</li> <li>• Temporary impacts for urban trail operations and maintenance are assumed to occur within 4 ft on either side of a trail</li> <li>• This analysis only attempts to capture trail impacts in in-stream areas; impacts in upland areas are identified in the Urban Development impact category</li> </ul>
Stream maintenance	<ul style="list-style-type: none"> <li>• Distribute 12 acres of temporary impact across the three riparian land-cover types in proportion to occurrence in Gilroy planning limits of urban growth</li> </ul>	<ul style="list-style-type: none"> <li>• City of Gilroy provided impact estimates of 3 acres 4 times per year (R. Smelser pers. comm.)</li> </ul>
<b>SCVWD</b>		
Canal Maintenance in Serpentine	No impacts assessed	<ul style="list-style-type: none"> <li>• No impacts are assumed for canal maintenance because full permanent impacts to canals are assumed under In-Stream CIP for canal reconstruction</li> </ul>
Ground-Disturbing, Winter work in Almaden-Calero	No impacts assessed	<ul style="list-style-type: none"> <li>• No impacts are assumed for winter work in Almaden-Calero canal because full permanent impacts to this canal are assumed under In-Stream CIP for canal reconstruction</li> </ul>
<b>County Roads and Airports</b>		
Bridge Maintenance	<ul style="list-style-type: none"> <li>• Determine the total length of all existing bridges</li> <li>• Multiply the total length of all existing and planned bridges by a maintenance width of 24 ft (12 ft buffer on each side of the bridge) and convert to acres to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in the County</li> <li>• Estimate temporary stream impacts by multiplying the maintenance buffer zone (24 ft) by the number of bridges to be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• County Roads is assumed to have 91 bridges that will be maintained</li> <li>• Temporary land cover impacts from operations and maintenance are assumed to occur within a 12 ft buffer up and downstream of the bridge (24 ft width total)</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> </ul>



Table 4-5c. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>County Parks</b>		
Bridge Maintenance	<ul style="list-style-type: none"> <li>• Determine the total length of all existing and planned bridges</li> <li>• Multiply the total length of all existing and planned bridges by a maintenance width of 24 ft (12 ft buffer on each side of the bridge) and convert to acres to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in the County</li> <li>• Estimate temporary stream impacts by multiplying the maintenance buffer zone (24 ft) by the number of bridges to be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts based on data provided by County of Santa Clara Parks Department containing a list of existing bridges; this list includes bridge width and length for each existing bridge</li> <li>• County Roads is assumed to have 69 bridges, inclusive of vehicular and trail stream crossing</li> <li>• Temporary land cover impacts from operations and maintenance are assumed to occur within a 12 ft buffer up and downstream of the bridge (24 ft width total)</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges or by new or expanded bridges</li> </ul>
<b>VTA</b>		
Light-rail bridge Maintenance	<ul style="list-style-type: none"> <li>• Determine the total length of all bridges</li> <li>• Multiply the total length of all bridges by a maintenance width of 24 ft (12 ft buffer on each side of the bridge) and convert to acres to identify acres of temporary impact</li> <li>• Distribute acres across the three riparian land covers in proportion to those land covers occurrence in San José city limits</li> <li>• Estimate temporary stream impacts by multiplying the maintenance buffer zone (24 ft) by the number of bridges to be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts based on data provided by VTA regarding location of bridges assumed to be reconstructed over the permit term</li> <li>• The average length is assumed to be 143 ft; this number corresponds to the average width and length of San José bridges; all VTA bridges are located in San José</li> <li>• Temporary land cover and stream impacts are assumed to occur within 12 ft upstream and downstream of the bridge crossing, for a total maintenance width of 24 ft along the linear stream; this assumption is based on County Roads maintenance buffers</li> <li>• Temporary impacts are not assumed for the area under the bridge as that area is assumed to be already permanently impacted by existing bridges</li> <li>• All eight bridges are located inside of the San José planning limit of urban growth; therefore, only riparian impacts are assessed as all other impacts are assessed under the Urban Development category</li> <li>• This method likely over estimates riparian impacts as it assumes impacts will temporarily affect riparian vegetation. It is likely that some bridge locations will not have existing riparian vegetation</li> </ul>

Table 4-5c. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>General</b>		
Natural resource protection (small bank stabilization projects, restoration to reduce erosion, fish passage enhancements, and debris)	<ul style="list-style-type: none"> <li>• For bank stabilization, multiply 10*50 feet*20 feet, convert to acres, and distribute this impact across riparian land-cover types in proportion to relative presence in the study area of the riparian land-cover types</li> <li>• For bank stabilization projects, multiply 10*50 feet, convert to miles of temporary steam impact</li> <li>• For erosion control projects, multiply 5*50 feet*50 feet, convert to acres, and distribute this impact across riparian land-cover types in proportion to relative presence in the study area of the riparian land-cover types</li> <li>• For erosion control projects, multiply 5*50 feet, convert to miles of temporary steam impact</li> <li>• For fish passage projects, multiply 2*50 feet*20 feet, convert to acres, and distribute this impact across riparian land-cover types in proportion to relative presence in the study area of the riparian land-cover types</li> <li>• For fish passage projects, multiply 2*50 feet, convert to miles of temporary steam impact</li> </ul>	<ul style="list-style-type: none"> <li>• Assume that Local Partners will request, on average, 10 bank stabilizations per year; each stabilization is 50 feet long and 20 feet wide; that this area will impact riparian vegetation; that one-half of the projects will require dewatering which results in a temporary stream impact</li> <li>• Assume that Local Partners will request, on average, 5 erosion correction projects per year; each project 50 feet long and 50 feet wide; that this area will impact riparian vegetation; that one-half of the projects will require dewatering which results in a temporary stream impact</li> <li>• Assume that Local Partners will request, on average, 2 fish passage enhancement projects per year; each project 50 feet long and 15 feet wide; that this area will impact riparian vegetation; that one-half of the projects will require dewatering which results in a temporary stream impact</li> <li>• Debris removal impacts are assumed to be too small to estimate</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-5d. Rural Capital Improvement Project Permanent Impact Estimation Methods and Key Assumptions**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<b>San José</b>		
Kirby Canyon Landfill expansion	<ul style="list-style-type: none"> <li>• Digitize in GIS the Kirby Canyon Landfill Fill Areas</li> <li>• Overlay digitized Fill Areas on the land cover layer</li> <li>• Assess impacts to land cover and to streams for Fill Areas 3 and 4</li> </ul>	<ul style="list-style-type: none"> <li>• The City of San José is seeking coverage under the Habitat Plan for development of Fill Areas 3 and 4</li> <li>• A digital aerial map of Kirby Canyon Landfill Fill Areas was provided that identified Fill Areas (T. Peterson pers. comm.)</li> </ul>
<b>Morgan Hill</b>		
Butterfield detention basin	<ul style="list-style-type: none"> <li>• Identify proposed Butterfield detention basin in GIS</li> <li>• Overlay footprint of detention basin on the land cover layer to determine land cover impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Impacts based on an AutoCAD file provided by City of Morgan Hill (S. Golden pers. comm.); AutoCAD files were imported into GIS</li> <li>• No stream impacts are assumed</li> </ul>
<b>SCVWD</b>		
Llagas recharge basins #1, #2, and #3, and Coyote Greenbelt recharge basin	<ul style="list-style-type: none"> <li>• SCVWD provided approximate project locations for the three Llagas groundwater recharge basins, and for the approximate location of the Coyote Greenbelt groundwater recharge basin</li> <li>• Digitize in GIS the boundaries for the location of the Llagas recharge basins and the Coyote Greenbelt basin</li> <li>• These boundaries are larger than the actual project, but represent the general area in which the project will occur</li> <li>• Assess total acres of each project area including acres of project area that is located inside of a planning limit of urban growth</li> <li>• Assess acres of land cover inside of each project area and determine proportion of each land cover within each project area</li> <li>• Calculate total project footprint based on percentage of project area acres inside/outside of a planning limit of urban growth (e.g., project area #3 is 69% located in the County and 31% located in Morgan Hill's planning limit of urban growth; therefore, for a 10 acre project, only 69% of 10 acres would be counted in the impacts because the other 31% was already assessed under Urban Development impacts)</li> <li>• Distribute project impacts proportionally across the land covers identified to be located in each project area</li> <li>• Include an additional 2.2 acres of impacts, distributed to barren and agriculture land covers</li> </ul>	<ul style="list-style-type: none"> <li>• For the Llagas recharge basins, total project footprint for each project is 10 acres (for a total of 30 acres)</li> <li>• Portions of the Llagas recharge basin project area fall within the Morgan Hill planning limit of urban growth; all impacts for areas zoned for development were included in the Urban Development impact assessment; therefore, portions of projects that overlap with Morgan Hill are not assessed in this analysis</li> <li>• For the Coyote Greenbelt basin, total project footprint is 15 acres</li> <li>• Coyote Greenbelt project will occur in the Coyote Greenbelt in close proximity to the Cross Valley Pipeline</li> <li>• 1.5 miles of new access road are assumed to be gravel roads, 12 ft wide and located in disturbed barren or agriculture lands</li> <li>• No stream impacts are assumed as the projects are not located in a stream or in a riparian area</li> </ul>

Table 4-5d. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<b>County Roads and Airports</b>		
South County Airport Master Plan	<ul style="list-style-type: none"> <li>• Digitize in GIS the extent of the airport, excluding existing developed areas, aviation easements, and proposed fee simple acquisition areas</li> <li>• Calculate the acres of each land cover type within this area</li> <li>• Distribute project impacts identified by the County proportionally across the land covers identified GIS</li> </ul>	<ul style="list-style-type: none"> <li>• The South County Airport Master Plan was used to identify areas of impact; lands identified as proposed aviation easements and proposed fee simple acquisition were not included in the impact analysis as they are not assumed to be developed further than already exists (e.g., developed residences may be removed and replaced with agricultural uses)</li> <li>• The County provided acres of estimated impacts to be 11.5 acres associated with runway extension and 26 acres associated with new facilities (D. Cameron pers. comm. a)</li> <li>• No stream impacts are assumed</li> </ul>
South County Circulation Study intersection improvement projects	<ul style="list-style-type: none"> <li>• Based on data provided, identify intersection projects in GIS</li> <li>• Apply project footprint width and length in GIS</li> <li>• Overlay project footprint on land cover layer</li> <li>• Assess impacts to land cover</li> </ul>	<ul style="list-style-type: none"> <li>• County of Santa Clara provided a spreadsheet of road intersection projects identified in the South County Circulation Study that may be completed during the permit term (D. Cameron pers. comm. b)</li> <li>• Data provided included width of expansion by intersection; most projects include an expansion of 12 ft (6 ft buffer) along 300 ft of road in each direction from the center of the intersection; these widths were used to identify new permanent impacts for each project</li> <li>• Impacts were not assessed for projects, or portions of projects, that overlap with a planning limit of urban growth AND that occur outside of in-stream areas as these impacts are already assessed under the Urban Development assumptions</li> <li>• No new stream impacts are assumed as all intersection improvements are made to existing intersections and replacement of existing bridges is assessed under the In-Stream CIP category</li> </ul>

Table 4-5d. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
South County Circulation Study road improvement projects	<ul style="list-style-type: none"> <li>• Based on data provided, identify project road segment in GIS</li> <li>• Apply project width to road line in GIS</li> <li>• Overlay resulting project footprint on land cover layer</li> <li>• Remove areas of overlap with South County Circulation Study Intersection Improvement Projects</li> <li>• Assess impacts to land cover</li> <li>• Identify number of stream crossings for each new road alignment by counting number of times the new road alignment crosses a stream</li> <li>• Multiply the number of crossings by 60 ft</li> </ul>	<ul style="list-style-type: none"> <li>• County of Santa Clara provided a spreadsheet of road projects identified in the South County Circulation Study that may be completed during the permit term (D. Cameron pers. comm. b)</li> <li>• Data provided included start and end points for each projects, and width of expansion or new road project; widths ranged from an additional 8 ft to 92 ft; these widths were used to identify new permanent impacts for each project</li> <li>• Impacts were not assessed for projects, or portions of projects, that overlap with a planning limit of urban growth, including projects that immediately border a planning limit of urban growth, AND that occur outside of in-stream areas as these impacts are already assessed under the Urban Development assumptions</li> <li>• Assume stream impacts only for new roads (impacts for replacement of existing roads is assessed under In-Stream CIP Construction category); Stream impacts were calculated based on number of crossings and the assumptions that each stream crossing was, on average, 60 ft</li> </ul>
County Roads safety projects and turn lanes	<ul style="list-style-type: none"> <li>• Multiply miles of safety and intersection projects by the appropriate width and convert to acres</li> <li>• Distribute 25 miles of safety projects and 0.5 mile of turning lane project impacts to land cover types proportional to those land cover type occurrences in the near and far east hill zones developed for the Rural Development analysis</li> <li>• Distribute 8 miles of safety projects and 1 mile of turning lane project impacts to land cover types proportional to those land cover type occurrences in the valley floor zone developed for the Rural Development analysis</li> </ul>	<ul style="list-style-type: none"> <li>• The County provided data for miles and width of safety and intersection projects, as well as general location of projects; 33 miles of safety projects, requiring 8 ft of new road, with 25 miles in the near east and west hills and the remainder on the valley floor; 1.5 miles of turn lanes requiring 12 ft of new road, with 0.5 miles in the near east and west hills and the remainder on the valley floor</li> <li>• No additional bridge expansions beyond those addressed in the road projects</li> </ul>

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<b>County Parks</b>		
New trails, fire roads, and development	<ul style="list-style-type: none"> <li>• Import County Parks covered activity impacts into the Plan's impact analysis</li> <li>• Reduce impacts by 25%</li> </ul>	<ul style="list-style-type: none"> <li>• County Parks conducted its own impact analysis and provided these impacts for inclusion in this Plan; this analysis evaluated all uses and impacts (recreational and natural resource management) anticipated to occur during the permit term and impacts associated with implementing the Plan's conservation strategy within County Parks lands</li> <li>• County Parks developed impact numbers and distributed impacts to land cover types based on existing land use in existing parks, components of master plans not yet implemented, and anticipated avoidance of certain land cover types</li> <li>• Assumptions for development outside of the planning limit of urban growth: 20 miles of fire road (12 ft wide); 25 miles of unpaved, single-track trail (5 ft wide); 3 miles of paved service roads (12 ft wide); 7 miles of paved multi-use trail (16 ft wide); and 10 miles of paved roads (20 ft wide); This does not include roads and trails that are part of a larger site development (e.g., nature center, large picnic areas, pavilions, golf course, etc.)</li> <li>• Assumptions for development outside of the planning limit of urban growth: larger-scale site development projects (e.g., nature center, large picnic areas, pavilions, golf course, etc.) requiring 1,700 acres</li> <li>• Assumptions for impacts to in-stream resources: 300 non-bridge water crossings (e.g., single-track trail crossings; 40 sq ft), 20 large bridges (i.e., one-or two-way automotive use; 924 sq ft), and 30 small bridges and puncheons (i.e., footbridges; 54 sq ft )</li> <li>• Assumption that County Parks will only implement approximately 75% of described projects</li> </ul>

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<b>VTA<sup>4</sup></b>		
U.S. 101 Improvement Project (Monterey Road to SR 129)	<ul style="list-style-type: none"> <li>• Acres of permanent impact by land cover type, including streams, provided by VTA were used to assess impacts</li> </ul>	<ul style="list-style-type: none"> <li>• This project includes extending Santa Teresa Boulevard from Castro Valley Road to US 101</li> <li>• This road extension requires a new bridge to be constructed across Gavilan Creek</li> <li>• VTA provided impact estimates for this project that were recently developed for the environmental compliance process for this project (A. Calnan pers. comm.); impacts included both permanent and temporary impacts</li> <li>• These impact estimates were used for both land cover and stream impacts</li> </ul>
U.S. 101 widening between Cochrane Rd. and Monterey Hwy	<ul style="list-style-type: none"> <li>• Identify project road segments in GIS</li> <li>• Apply a 50 ft buffer to the existing road line in GIS</li> <li>• Overlay on the land cover layer</li> <li>• Assess impacts to land cover</li> <li>• Identify number of stream crossings along the length of the project by counting number of times the project crosses a stream</li> <li>• Multiply the number of crossings by 100 ft to determine stream impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Assume a buffer of 50 ft (100 ft width) on either side of the existing road line</li> <li>• Assume a stream impact width of 100 ft per stream crossing</li> <li>• A portions of this project fall within the Morgan Hill and Gilroy planning limits of urban growth</li> <li>• Areas inside the planning limit of urban growth AND outside of the in-stream areas were excluded from the analysis as impacts for these areas are assessed under urban development</li> <li>• Assume a stream impact width of 100 ft per stream crossing</li> </ul>
Buena Vista Interchange	No impacts assessed	<ul style="list-style-type: none"> <li>• The Buena Vista Interchange is located inside of the Gilroy planning limit of urban growth and does not overlap with any in-stream areas or stream channels; no additional impacts (beyond those assumed for areas inside planning limits of urban growth under urban development) are assumed for this project</li> </ul>
Caltrain Double Tracking	<ul style="list-style-type: none"> <li>• Identify project track segments in GIS</li> <li>• Apply a 50 ft buffer to the existing track line in GIS</li> <li>• Overlay on the land cover layer</li> <li>• Assess impacts to land cover</li> <li>• Identify number of stream crossings along the length of the project by counting number of times the project crosses a stream</li> <li>• Multiply the number of crossings by 100 ft</li> </ul>	<ul style="list-style-type: none"> <li>• Assume a buffer of 50 ft (100 ft width) on either side of the existing track line</li> <li>• Assume a stream impact width of 100 ft per stream crossing</li> </ul>

Table 4-5d. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
Coyote Valley Parkway Interchange	<ul style="list-style-type: none"> <li>• Identify project road segments in GIS</li> <li>• Apply a 50 ft buffer to the existing road line in GIS</li> <li>• Overlay on the land cover layer</li> <li>• Assess impacts to land cover</li> <li>• Identify number of stream crossings along the intersection by counting number of times the project crosses a stream</li> <li>• Multiply the number of crossings by 100 ft</li> </ul>	<ul style="list-style-type: none"> <li>• Assume a buffer of 50 ft (100 ft width) on either side of the existing road line</li> <li>• Assume a stream impact width of 100 ft per stream crossing</li> </ul>
East Middle Interchange	<ul style="list-style-type: none"> <li>• Identify project road segments in GIS</li> <li>• Apply a 50 ft buffer to the existing road line in GIS</li> <li>• Overlay on the land cover layer</li> <li>• Assess impacts to land cover</li> <li>• Identify number of stream crossings along the intersection by counting number of times the project crosses a stream</li> <li>• Multiply the number of crossings by 100 ft</li> </ul>	<ul style="list-style-type: none"> <li>• Assume a buffer of 50 ft (100 ft width) on either side of the existing road line</li> <li>• Assume a stream impact width of 100 ft per stream crossing</li> </ul>
SR 152/SR 156 Interchange	<ul style="list-style-type: none"> <li>• Overlay project footprint on the land cover layer in GIS</li> <li>• Calculate the acres of impact for each land cover type</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided a GIS footprint of the project that included both permanent and temporary impact zones (A. Calnan pers. comm.)</li> <li>• The project footprint does not overlap with any streams</li> </ul>
U.S. 101 HOV/HOT lane (western study area boundary to Cochrane Road)	<ul style="list-style-type: none"> <li>• Use GIS to map length of project</li> <li>• For calculating land cover impacts other than in-stream, exclude areas inside the planning limit of urban growth</li> <li>• For areas outside the planning limit of urban growth, multiply length of project by 32 ft (2 lanes plus 2 shoulders) and convert to acres of impact</li> <li>• Apply acres of impact to annual grassland land cover type</li> <li>• Using aerial photos, identify length and width of stream crossings</li> <li>• Add 24 ft to width of crossing (linear ft of stream)</li> <li>• Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the City of San José or the valley floor rural development zone, depending on the location of the crossing</li> <li>• Assess permanent impacts to streams at 24 ft per crossing</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided project location</li> <li>• Assume 12 ft for a new HOV/HOT lane in each direction, plus 4 ft in each direction for additional shoulder</li> <li>• All impacts occur in the existing median</li> <li>• Median is categorized as annual grassland land cover type</li> <li>• Impacts inside the planning limit of urban growth are excluded because these area were assessed under the Urban Development impact category, with the exception of stream crossings</li> <li>• Each stream crossing will require bridge widening of 24 ft</li> </ul>



Table 4-5d. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
U.S. 101 HOV/HOT lane (Cochrane Road to Masten Avenue; VTA ID H6)	<ul style="list-style-type: none"> <li>• Use GIS to map length of project</li> <li>• Multiply length of project by 32 ft (2 lanes plus 2 shoulders) and convert to acres of impact</li> <li>• Apply acres of impact to annual grassland land cover type</li> <li>• Using aerial photos, identify length and width of stream crossing</li> <li>• Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist on the valley floor</li> <li>• Assess impacts to streams consistent with the required width of the new bridge</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided project location</li> <li>• Assume 12 ft for a new HOV/HOT lane in each direction, plus 4 ft in each direction for additional shoulder</li> <li>• All impacts occur in the existing median</li> <li>• Median is categorized as annual grassland land cover type</li> <li>• Impacts inside the planning limit of urban growth are excluded because these area were assessed under the Urban Development impact category, with the exception of stream crossings</li> <li>• One stream crossing will require a new bridge</li> </ul>
U.S. 101 HOV/HOT lane (Masten Avenue to 10th Street; VTA ID H7)	<ul style="list-style-type: none"> <li>• Using aerial photos, identify width of stream crossing</li> <li>• Assess impacts to streams consistent with the required width of the new bridge</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided project location</li> <li>• This project is located entirely within the planning limit of urban growth for Gilroy, the development of which is covered in the Urban Development category; no impacts are assessed aside from the stream crossing</li> <li>• One stream crossing will require a new bridge</li> <li>• No riparian impacts are assumed because aerial photos show this reach of stream is channelized and does not support any riparian vegetation</li> </ul>
U.S. 101 HOV/HOT lane (10th Street to SR 25; VTA ID H8)	<ul style="list-style-type: none"> <li>• Use GIS to map length of project</li> <li>• Multiply length of project by 32 (2 lanes plus 2 shoulders) and convert to acres of impact</li> <li>• Apply acres of impact to annual grassland land cover type</li> <li>• Using aerial photos, identify length and width of stream crossing</li> <li>• Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist in Gilroy</li> <li>• Assess impacts to streams consistent with the required width of the new bridge</li> </ul>	<ul style="list-style-type: none"> <li>• VTA provided project location</li> <li>• Assume 12 ft for a new HOV/HOT lane in each direction, plus 4 ft in each direction for additional shoulder</li> <li>• All impacts occur in the existing median</li> <li>• Median is categorized as annual grassland land cover type</li> <li>• Impacts inside the planning limit of urban growth are excluded because these area were assessed under the Urban Development impact category, with the exception of stream crossings</li> <li>• One stream crossing will require a new bridge</li> </ul>

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.		
<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).		
<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).		
<sup>4</sup> All VTA projects are listed in Table 2-6.		
<b>Note:</b> This table of impact analysis methods and key assumptions is not intended to be all inclusive. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.		

**Table 4-5e.** Rural Capital Improvement Project Construction Temporary Impact Estimation Methods and Key Assumptions

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
<b>San José</b>		
Kirby Canyon Landfill Expansion	No impacts assessed	<ul style="list-style-type: none"> <li>Construction impacts are assumed to be included within the permanent impacts for Kirby Canyon landfill</li> </ul>
<b>Morgan Hill</b>		
Butterfield detention basin	<ul style="list-style-type: none"> <li>Identify proposed Butterfield detention basin in GIS</li> <li>Apply a 10 ft buffer around the project footprint</li> <li>Overlay the buffer on the land cover layer in GIS</li> <li>Assess temporary impacts to land cover</li> </ul>	<ul style="list-style-type: none"> <li>Impacts based on an AutoCAD file provided by City of Morgan Hill (S. Golden pers. comm.); AutoCAD files were imported into GIS</li> <li>Temporary construction impacts are assumed to occur within a 10 ft buffer around the project footprint</li> <li>No stream impacts are assumed</li> </ul>
<b>SCVWD</b>		
Llagas Recharge basins #1, #2, and #3, and Coyote Greenbelt Recharge basin	<ul style="list-style-type: none"> <li>Based on 10-acre or 15-acre square sites, identify the acres of construction and staging area within a 10 ft buffer of the project site</li> <li>Scale construction buffer impacts according to how much of the project area is located outside of a planning limit of urban growth</li> <li>Distribute construction buffer impacts proportionally across the land covers identified to be located in the project area (conducted a part of capital improvement project impact assessment)</li> </ul>	<ul style="list-style-type: none"> <li>Project areas will be approximately square</li> <li>Buffer of average distance outside of project area that will be impacted during construction is 10 ft</li> <li>1.5 miles of new access road are assumed to temporarily disturb 1 ft on either side of the road and will affect the same land-cover types as the permanent road footprint</li> <li>No stream impacts are assumed as the projects are not located in a stream or in a riparian area</li> </ul>
<b>County Roads and Airports</b>		
South County Airport Master Plan	<ul style="list-style-type: none"> <li>Multiply permanent land cover impacts for this project by 10%</li> </ul>	<ul style="list-style-type: none"> <li>Temporary construction impacts to land cover are assumed to be 10% of the total permanent impacts to land cover</li> <li>No stream impacts are assumed</li> </ul>
South County Circulation Study intersection improvement projects	<ul style="list-style-type: none"> <li>Based on data provided, identify intersection projects in GIS</li> <li>Apply 10 ft buffer to project footprint in GIS</li> <li>Overlay construction buffer on land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify temporary stream impacts by multiplying the permanent stream impacts by one-third</li> </ul>	<ul style="list-style-type: none"> <li>County of Santa Clara provided a spreadsheet of road intersection projects identified in the South County Circulation Study that may be completed during the permit term (D. Cameron pers. comm.)</li> <li>Impacts were not assessed for projects, or portions of projects, that overlap with a planning limit of urban growth AND that occur outside of in-stream areas as these impacts are already assessed under the Urban Development assumptions</li> <li>Assume temporary impacts to land cover occur in a 10 ft buffer<sup>4</sup> around project footprints</li> <li>Assume temporary stream impacts occur within a 10 ft construction buffer (20 ft width); this is equal to one-third of permanent stream impacts</li> </ul>

Table 4-5e. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
South County Circulation Study road improvement projects	<ul style="list-style-type: none"> <li>Based on data provided, identify intersection projects in GIS</li> <li>Apply 10 ft buffer to project footprint in GIS</li> <li>Overlay construction buffer on land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify number of stream crossings for each new road alignment by counting number of times the new road alignment crosses a stream</li> <li>Multiply the number of crossings by 20 ft</li> </ul>	<ul style="list-style-type: none"> <li>County of Santa Clara provided a spreadsheet of road projects identified in the South County Circulation Study that may be completed during the permit term (D. Cameron pers. comm.)</li> <li>Impacts were not assessed for projects, or portions of projects, that overlap with a planning limit of urban growth AND that occur outside of in-stream areas as these impacts are already assessed under the Urban Development assumptions</li> <li>Assume temporary impacts to land cover occur in a 10 ft buffer around project footprints</li> <li>Assume stream impacts only for new roads (impacts for replacement of existing roads is assessed under In-stream CIP Construction category); Assume temporary stream impacts occur within a 10 ft construction buffer (20 ft width)</li> </ul>
County Roads safety projects and turn lanes	<ul style="list-style-type: none"> <li>Multiply miles of safety and intersection projects by the appropriate width assumed for temporary construction impacts and convert to acres</li> <li>Distribute 25 miles of safety projects and 0.5 mile of turning lane project impacts to land-cover types proportional to those land-cover type occurrences in the near and far east hill zones developed for the Rural Development analysis</li> <li>Distribute 8 miles of safety projects and 1 mile of turning lane project impacts to land-cover types proportional to those land-cover type occurrences in the valley floor zone developed for the Rural Development analysis</li> </ul>	<ul style="list-style-type: none"> <li>The County provided data for miles and width of safety and intersection projects, as well as general location of projects; 33 miles of safety projects, with 25 miles in the near east and west hills and the remainder on the valley floor; 1.5 miles of turn lanes with 0.5 miles in the near east and west hills and the remainder on the valley floor</li> <li>Assume temporary construction impacts is 4 ft for safety projects and 6 ft for turning lane projects (or 50% of the permanent impact)</li> <li>No additional bridge expansions beyond those addressed in the road projects</li> </ul>
<b>County Parks</b>		
New trails, fire roads, and development	<ul style="list-style-type: none"> <li>Multiply permanent land cover impacts for these actions by 10%</li> </ul>	<ul style="list-style-type: none"> <li>Temporary construction impacts to land cover, excluding streams, are assumed to be 10% of the total permanent impacts to land cover</li> <li>Temporary construction stream impacts for County Parks projects are assumed under In-Stream CIP Construction new trails, fire roads, and development</li> </ul>
<b>VTA</b>		
U.S. 101 Improvement Project (Monterey Road to SR 129)	<ul style="list-style-type: none"> <li>Acres of temporary impact by land cover type provided by VTA were used to assess impacts</li> </ul>	<ul style="list-style-type: none"> <li>VTA provided impact estimates for this project that were recently developed for the environmental compliance process for this project (A. Calnan pers. comm.); impacts included both permanent and temporary impacts</li> <li>These impact estimates were used for both land cover and stream impacts</li> </ul>

Table 4-5e. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
U.S. 101 widening between Cochrane Rd. and Monterey Hwy	<ul style="list-style-type: none"> <li>Identify project road segment in GIS</li> <li>Apply a 20 ft construction buffer to the project footprint in GIS</li> <li>Overlay on the land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify temporary stream impacts by multiplying permanent stream impacts for this project by 20%</li> </ul>	<ul style="list-style-type: none"> <li>Assume a construction buffer of 20 ft (40 ft width) around the project footprint</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing; this equals 20% of the value calculated for permanent impacts associated with the stream project</li> </ul>
Buena Vista Interchange	No impacts assessed	<ul style="list-style-type: none"> <li>The Buena Vista Interchange is located inside of the San José planning limit of urban growth and does not overlap with any in-stream areas or stream channels; no additional impacts (beyond those assumed for areas inside planning limits of urban growth) are assumed for this project</li> </ul>
Caltrain Double Tracking	<ul style="list-style-type: none"> <li>Identify project track segment in GIS</li> <li>Apply a 20 ft construction buffer to the project footprint in GIS</li> <li>Overlay on the land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify temporary stream impacts by multiplying permanent stream impacts for this project by 20%</li> </ul>	<ul style="list-style-type: none"> <li>Assume a construction buffer of 20 ft (40 ft width) around the project footprint</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing; this equals 20% of the value calculated for permanent impacts associated with the stream project</li> </ul>
Coyote Valley Parkway Interchange	<ul style="list-style-type: none"> <li>Identify project road segment in GIS</li> <li>Apply a 20 ft construction buffer to the project footprint in GIS</li> <li>Overlay on the land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify temporary stream impacts by multiplying permanent stream impacts for this project by 20%</li> </ul>	<ul style="list-style-type: none"> <li>Assume a construction buffer of 20 ft (40 ft width) around the project footprint</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing; this equals 20% of the value calculated for permanent impacts associated with the stream project</li> </ul>
East Middle Interchange	<ul style="list-style-type: none"> <li>Identify project road segment in GIS</li> <li>Apply a 20 ft construction buffer to the project footprint in GIS</li> <li>Overlay on the land cover layer</li> <li>Assess impacts to land cover</li> <li>Identify temporary stream impacts by multiplying permanent stream impacts for this project by 20%</li> </ul>	<ul style="list-style-type: none"> <li>Assume a construction buffer of 20 ft (40 ft width) around the project footprint</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing; this equals 20% of the value calculated for permanent impacts associated with the stream project</li> </ul>
SR 152/SR 156 Interchange	<ul style="list-style-type: none"> <li>Overlay project footprint on the land cover layer in GIS</li> <li>Calculate the acres of impact for each land-cover type</li> </ul>	<ul style="list-style-type: none"> <li>VTA provided a GIS footprint of the project that included both permanent and temporary impact zones (A. Calnan pers. comm.)</li> <li>The project footprint does not overlap with any streams</li> </ul>

Table 4-5e. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1,2,3</sup>
U.S. 101 HOV/HOT lane (western study area boundary to Cochrane Road)	<ul style="list-style-type: none"> <li>Convert to acres and apply impacts to the riparian land cover types proportional to how those land cover types exist within the City of San José or the valley floor rural development zone, depending on the location of the crossing</li> </ul>	<ul style="list-style-type: none"> <li>All construction impacts are assumed to occur on the adjacent freeway or within the median that is being permanently impacted, with the exception of in-stream areas</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> <li>Assume a temporary riparian impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> </ul>
U.S. 101 HOV/HOT lanes (Cochrane Road to Masten Avenue; VTA ID H6)	<ul style="list-style-type: none"> <li>20 ft of linear stream temporary impact per stream crossing</li> <li>Multiply 20 ft by the length of each crossing as identified under the permanent impact calculations and convert to acres</li> <li>Convert to acres and apply impacts to the riparian land cover types</li> </ul>	<ul style="list-style-type: none"> <li>All construction impacts are assumed to occur on the adjacent freeway or within the median that is being permanently impacted with the exception of in-stream areas</li> <li>Assume a temporary stream impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> <li>Assume a temporary riparian impact buffer of 10 ft (20 ft total width) on either side of the crossing</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).

<sup>4</sup> Buffers described for temporary impacts identify the area immediately surrounding the footprint of the associated project where temporary impacts are assumed to occur. Temporary impact buffers are in addition to buffers assumed to represent the project footprint as described in Table 4-5d.

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-5f. Rural Operations and Maintenance Temporary Impact Estimation Methods and Key Assumptions**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>SCVWD</b>		
<i>Pipeline Maintenance Program</i>		<ul style="list-style-type: none"> <li>• All impacts assessed under the Pipeline Maintenance Program were derived from the Pipeline Maintenance Program EIR (Santa Clara Valley Water District 2006)</li> <li>• The Pipeline Maintenance Program covers SCVWD's activities throughout the County, not only in the Habitat Plan study area; therefore, impacts assessed here are slightly over estimated</li> <li>• The Pipeline Maintenance Program uses the term "aquatic" to describe impacts to acres of stream. This Plan assesses stream, or riverine, impacts linearly. For this analysis, acres of impact assessed for aquatic habitats in the Pipeline Maintenance Program are included in the riparian land cover type impacts. Aquatic impacts were also used to derive liner stream impacts</li> <li>• These analyses did not use GIS to derive total impact numbers</li> <li>• Impacts are calculated on an annual basis</li> </ul>
Staging	<ul style="list-style-type: none"> <li>• Identify acres of impact described in the Pipeline Maintenance Program EIR for upland impacts related to staging</li> <li>• Distribute acres of upland impact proportionally across all upland land covers in the study area</li> </ul>	<ul style="list-style-type: none"> <li>• Upland impacts assume that 5 pipelines are maintained per year; that there are up to 20 staging areas per pipeline in natural areas; and that each staging area is up to 100 ft by 100 ft</li> <li>• Impacts are applied to the proportion of land cover throughout the entire study area, inclusive of land covers excluded from the baseline data; this is based on the fact that SCVWD supply pipelines occur throughout the entire study area</li> <li>• Upland land covers include all land covers except the Riparian Forest and Scrub natural community land covers and the Reservoir land cover</li> </ul>
Off-road access	<ul style="list-style-type: none"> <li>• Identify acres of impact described in the Pipeline Maintenance Program EIR for upland impacts related to off-road access</li> <li>• Distribute acres of upland impact proportionally across all upland land covers in the study area</li> <li>• Identify acres of impact described in the Pipeline Maintenance Program EIR for riparian impacts related to off-road access</li> <li>• Distribute acres of riparian impact proportionally across all riparian land covers in the study area</li> </ul>	<ul style="list-style-type: none"> <li>• Upland impacts assume that 5 pipelines per year are maintained; up to 12 access points per pipeline; access areas are up to 15 ft by 1 mile</li> <li>• Riparian impacts assume that 5 pipelines per year in which they are maintained; up to 3 access points in riparian areas; access area would be up to 15 by 50 ft</li> <li>• Impacts are applied to the proportion of land cover throughout the entire study area, inclusive of land covers excluded from the baseline data; this is based on the fact that SCVWD supply pipelines occur throughout the entire study area</li> <li>• Upland land covers include all land covers except the Riparian Forest and Scrub natural community land covers and the Reservoir land cover</li> <li>• Riparian land covers include all land covers in the Riparian Forest and Scrub natural community</li> </ul>

Table 4-5f. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Draining	<ul style="list-style-type: none"> <li>• Identify acres of impact to riparian and aquatic habitats described in the Pipeline Maintenance Program EIR</li> <li>• Distribute acres of impact proportionally across all riparian land covers in the study area</li> <li>• Identify linear ft of stream impacts described in the Pipeline Maintenance Program EIR</li> <li>• Distribute linear ft of stream impacts to the streams, or riverine, land cover type</li> </ul>	<ul style="list-style-type: none"> <li>• Riparian impacts assume placement of erosion control structures would impact up to 15 by 20 ft; up to 10 structures placed per year</li> <li>• Aquatic impacts assume that no more than 10 temporary flow check dams would be installed per year and that the maximum impact area per dam would be 5 ft by 25 ft</li> <li>• Stream impacts assume that the longest in linear stream feet that a temporary flow dam could be is 25 ft; assume 25 ft for each of the 10 installations per year</li> <li>• Impacts are applied to the proportion of land cover throughout the entire study area, inclusive of land covers excluded from the baseline data; this is based on the fact that SCVWD supply pipelines occur throughout the entire study area</li> <li>• Riparian land covers include all land covers in the Riparian Forest and Scrub natural community</li> </ul>
Excavation	<ul style="list-style-type: none"> <li>• Identify acres of impact described in the Pipeline Maintenance Program EIR for upland impacts related to excavation</li> <li>• Distribute acres of upland impact proportionally across all upland land covers in the study area</li> <li>• Identify acres of impact to riparian and aquatic habitats described in the Pipeline Maintenance Program EIR</li> <li>• Distribute acres of impact proportionally across all riparian land covers in the study area</li> <li>• Identify acres of wetland impacts described in the Pipeline Maintenance Program EIR</li> <li>• Distribute acres of wetland impacts to the seasonal wetland land cover type</li> <li>• Identify linear ft of stream impacts described in the Pipeline Maintenance Program EIR</li> <li>• Distribute linear ft of stream impacts to the streams, or riverine, land cover type</li> </ul>	<ul style="list-style-type: none"> <li>• Upland impacts assume up to 4 pipelines; excavation area per pipeline of 25 ft by 1 mile per pipeline; AND up to 10 point excavations of 25 ft by 25 ft each per pipeline</li> <li>• Riparian impacts assume a maximum of 3 excavations in riparian corridors per year, each excavation with a maximum footprint of 25 ft by 50 ft; also assumes a max of 1 acre per year of disturbance due to road repair</li> <li>• Aquatic impacts assume up to 3 blow-off points across all systems; excavation area of 25 ft by 50 ft</li> <li>• Wetland impacts assume up to 1 acre of wetland impact per year</li> <li>• Stream impacts assume 50 ft of stream impact per blow-off excavation; 3 excavations per year</li> <li>• Upland land covers include all land covers except the Riparian Forest and Scrub natural community land covers and the Reservoir land cover</li> <li>• Riparian land covers include all land covers in the Riparian Forest and Scrub natural community</li> </ul>
Excavation—bank stabilization	<ul style="list-style-type: none"> <li>• Identify acres of impact to aquatic habitats described in the Pipeline Maintenance Program EIR</li> <li>• Distribute acres of impact proportionally across all riparian land covers in the study area</li> <li>• Identify linear ft of stream impacts described in the Pipeline Maintenance Program EIR</li> <li>• Distribute linear ft of stream impacts to the streams, or riverine, land cover type</li> </ul>	<ul style="list-style-type: none"> <li>• Aquatic impacts assume 0.5 stabilizations per year; assumed to occur on each side of the channel; each side is 25 ft by 10 ft</li> <li>• Stream impacts assumes 0.5 bank stabilizations per year; each stabilization is 25 ft long</li> </ul>



Table 4-5f. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>County Roads and Airports</b>		
Road maintenance	<ul style="list-style-type: none"> <li>• In GIS, identify County mountain roads</li> <li>• Apply a 10 ft buffer to County roads</li> <li>• Overlay on the land cover layer to assess acres of impact by land cover type</li> </ul>	<ul style="list-style-type: none"> <li>• Assume a 10 ft maintenance buffer (20 ft width) (D. Cameron pers. comm.)</li> <li>• Assume all roads outside of a planning limit of urban growth will be maintained (impacts of road maintenance inside the planning limit of urban growth is incorporated into the urban development impacts)</li> <li>• Most (65%) of County roads occur in the valley floor area where shoulders are highly disturbed and often lacking vegetation; most impacts associated with road maintenance will occur on the 35% of County roads that are mountain roads that have vegetation on either side; only maintenance of mountain roads is assumed to have impacts to natural land cover (D. Cameron pers. comm.)</li> <li>• Stream impacts for road maintenance are identified under In-Stream O&amp;M for bridges</li> </ul>
South County Airport	<ul style="list-style-type: none"> <li>• In GIS, identify areas in the South County Airport that are not currently developed or proposed for development</li> <li>• Overlay area on land cover map</li> <li>• Exclude any in-stream areas</li> <li>• Subtract acres identified in Rural CIP projects from the total land assessed at the airport (first bullet)</li> <li>• Distribute remaining acres across land cover types in proportion to land cover type occurrence in the airport</li> </ul>	<ul style="list-style-type: none"> <li>• Lands identified in the South County Airport Master Plan as proposed aviation easements and proposed fee simple acquisition were not included in the analysis because these areas are not assumed to be affected by covered activities</li> <li>• Assume that all areas not identified for future permanent impacts will need to be maintained (mowed)</li> <li>• Assume that the County will avoid all impacts to in-stream areas</li> </ul>
<b>County Parks</b>		
Trail maintenance	<ul style="list-style-type: none"> <li>• In GIS, overlay the trail layer provided by the County on the land cover layer</li> <li>• Apply a 4 ft buffer</li> <li>• Assess acres of temporary impacts to land cover</li> </ul>	<ul style="list-style-type: none"> <li>• County Parks provided GIS for existing trails (J. Falkowski pers. comm. a)</li> <li>• Trails maintenance based on 4 ft buffer (8 ft total width) to both unpaved and paved County trails</li> <li>• Stream impacts are assessed under In-Stream O&amp;M activities</li> </ul>
Road maintenance	<ul style="list-style-type: none"> <li>• In GIS, overlay the road layer provided by the County on the land cover layer</li> <li>• Apply a 8 ft buffer</li> <li>• Assess acres of temporary impacts to land cover</li> </ul>	<ul style="list-style-type: none"> <li>• County Parks provided GIS for existing paved and non-paved roads (J. Falkowski pers. comm. a)</li> <li>• Service Roads and Paved Roads maintenance based on an 8 ft buffer (16 ft width)</li> <li>• Stream impacts are assessed under In-Stream O&amp;M activities</li> </ul>
Parking lot maintenance	<ul style="list-style-type: none"> <li>• In GIS, overlay the parking lot layer provided by the County on the land cover layer</li> <li>• Apply a 8 ft buffer around the perimeter of the lots</li> <li>• Assess acres of temporary impacts to land cover</li> </ul>	<ul style="list-style-type: none"> <li>• County Parks provided GIS for existing paved and unpaved parking lots (J. Falkowski pers. comm. b)</li> <li>• Paved and unpaved parking lots based on an 8 ft buffer around lot</li> <li>• No stream impacts are assumed</li> </ul>

Table 4-5f. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>Other</b>		
Utility line operations and maintenance	<ul style="list-style-type: none"> <li>• Convert 50 miles to ft</li> <li>• Multiply resulting number of ft by 15 ft width</li> <li>• Convert to acres</li> <li>• Distribute acres of impact</li> </ul>	<ul style="list-style-type: none"> <li>• 50 miles of lines maintained/replaced in the study area</li> <li>• Assume that 5 ft will be disturbed for excavating the utility; and 10 ft will be disturbed for access; total impact of 15 ft width</li> <li>• Assume that utility maintenance will proportionally impact all land cover types in the study area</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-5g. Reserve System Permanent Impact Estimation Methods and Key Assumptions**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>Implementing Entity and other Landowners that Implement Covered Activities within the Reserve System</b>		
Installation of signage (boundary, landbank, etc.)	<ul style="list-style-type: none"> <li>Identify acres in the Reserve System in thousands</li> <li>Multiply by 25%</li> <li>Distribute acres of impact to the grassland land cover</li> </ul>	<ul style="list-style-type: none"> <li>Assume that 0.25 acres per 1,000 acres of Reserve System will be affected by placement of signage</li> <li>Assume that the signage will be sited on grassland land cover</li> </ul>
Installation of new fences	<ul style="list-style-type: none"> <li>Approximately 278,000*2 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume that 278,000 ft of new fences will be installed over the permit term; equal to 53 miles</li> <li>Assume 2 ft wide permanent impact</li> <li>Assume that fences will proportionally impact all land cover types in the Reserve System</li> </ul>
Field facilities	<ul style="list-style-type: none"> <li>Identify number of facilities in Reserve System based on assumption</li> <li>Multiply by 1 acre</li> <li>Apply acres of impact to the grassland land cover</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 facility per 10,000 acres of Reserve System</li> <li>Assume 1 acre per facility will be affected</li> <li>Assume that the facility will be sited on grassland land cover</li> </ul>
Wells	<ul style="list-style-type: none"> <li>Identify number of wells in Reserve System based on assumption</li> <li>Multiply by 0.1</li> <li>Distribute acres of impact</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 well per 1,000 acres of Reserve System</li> <li>Assume 0.1 acre per well will be affected</li> <li>Assume that the wells will be sited on grassland land cover</li> </ul>
Dirt Roads	<ul style="list-style-type: none"> <li>Approximately 40*5280*12 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume 40 miles of dirt road will be constructed over the permit term</li> <li>Assume 12 ft wide</li> <li>Assume that dirt roads will proportionally impact all land cover types in the Reserve System</li> </ul>
Paved Roads	<ul style="list-style-type: none"> <li>Approximately 12.5*5280*24 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume 0.25 miles of paved road will be constructed per year; 12.5 miles total</li> <li>Assume 24 ft wide area will be affected</li> <li>Assume that paved roads will proportionally impact all land cover types in the Reserve System</li> </ul>
New vehicle bridges	<ul style="list-style-type: none"> <li>Approximately 5*8*39 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all riparian land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>“Bridges” includes all types of vehicle crossings including culverts</li> <li>Assume 0.5 bridges every 5 years; 5 total</li> <li>Assume 8 ft wide, and 39 ft long (based on average bridge width and length for County Parks bridges)</li> <li>Assume that vehicle bridges will proportionally impact all riparian land cover types in the Reserve System</li> <li>No permanent stream impacts are assumed as any new bridges built will be balanced with removal of an equal or greater amount of bridges</li> </ul>

Table 4-5g. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Vehicle bridge replacement	<ul style="list-style-type: none"> <li>Approximately 10*2*39 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all riparian and California annual grassland land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 replacement every 5 years; 10 total</li> <li>Assume replacement bridges are 2 ft wider than existing bridges and 39 ft long</li> <li>Assume that bridges will proportionally impact all riparian and California annual grassland land cover types in the Reserve System</li> <li>No permanent stream impacts are assumed as any new impacts will be balanced with removal of an equal or greater amount of streams</li> </ul>
Trail bridges	<ul style="list-style-type: none"> <li>Approximately 25*8*39 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all riparian land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume 2.5 bridges every 5 years; 25 total</li> <li>Assume 8 ft wide and 39 ft long (based on average bridge width and length for County Parks bridges)</li> <li>Assume that vehicle bridges will proportionally impact all riparian land cover types in the Reserve System</li> <li>No permanent stream impacts are assumed as any new bridges built will be balanced with removal of an equal or greater amount of bridges</li> </ul>
Trails	<ul style="list-style-type: none"> <li>Approximately 126*5280*5 sq ft</li> <li>Convert to acres</li> <li>Distribute acres of impact proportionally across all land cover types in the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>Assume 126 miles total trails will be built in the Reserve System</li> <li>Assume a 5 ft width will be affected</li> <li>Assume that trails will proportionally impact all land cover types in the Reserve System</li> </ul>
Trailhead facilities	<ul style="list-style-type: none"> <li>Identify number of trailhead facilities in Reserve System based on assumption</li> <li>Multiply by 5 acres</li> <li>Apply acres of impact to the grassland land cover</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 trailhead facility per 5,000 acres of Reserve System</li> <li>Assume 5 acres per facility will be affected</li> <li>Assume that trailhead facilities will be sited on grassland land cover</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description or Key Assumptions column).

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive of all covered activities. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-5h. Reserve System Construction Temporary Impact Estimation Methods and Key Assumptions**

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
<b>Implementing Entity and other Landowners that Implement Covered Activities within the Reserve System</b>		
Installation of signage (boundary, landbank, etc.)	No impacts assessed	<ul style="list-style-type: none"> <li>Assume that each project site is very small; no construction impacts assumed</li> </ul>
Installation of new fences	<ul style="list-style-type: none"> <li>Temporary impacts are equal to permanent impacts</li> </ul>	<ul style="list-style-type: none"> <li>An area equal to permanent impact is assumed for temporary construction impacts</li> <li>Assume that 278,000 ft of new fences will be installed over the permit term; equal to 53 miles</li> <li>Assume 2 ft wide permanent impact</li> <li>Assume that fences will proportionally impact all land cover types in the Reserve System</li> </ul>
Field facilities	<ul style="list-style-type: none"> <li>Approximately 10*220*4 sq ft per facility</li> <li>Multiply by number of facilities</li> <li>Convert to acres</li> <li>Distribute acres of impact</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 facility per 10,000 acres of Reserve System</li> <li>Assume a 10 ft buffer around a 1 acre footprint will be affected; and acre is approximately 220 ft by 220 ft</li> <li>Assume that the facility will be sited on grassland land cover</li> </ul>
Wells	<ul style="list-style-type: none"> <li>Approximately 10*22*4 sq ft per well</li> <li>Multiply by number of wells</li> <li>Convert to acres</li> <li>Distribute acres of impact</li> </ul>	<ul style="list-style-type: none"> <li>Assume 1 well per 1,000 acres of Reserve System</li> <li>Assume a 10 ft buffer around a 0.1 acre per well will be affected; 1/10 acre is approximately 22 ft by 22 ft</li> <li>Assume that the wells will be sited on grassland land cover</li> </ul>
Dirt roads	<ul style="list-style-type: none"> <li>Temporary impacts are equal to 5/6ths of the permanent impacts</li> </ul>	<ul style="list-style-type: none"> <li>Assume 40 miles of ranch road will be constructed over the permit term</li> <li>Assume 5 ft construction buffer (10 ft width)</li> <li>Assume that dirt roads will proportionally impact all land cover types in the Reserve System</li> </ul>
Paved roads	<ul style="list-style-type: none"> <li>Temporary impacts are equal to 5/12ths of the permanent impacts</li> </ul>	<ul style="list-style-type: none"> <li>Assume 0.25 miles of paved road will be constructed per year; 12.5 miles total</li> <li>Assume 5 ft wide buffer (10 ft width) will be affected</li> <li>Assume that paved roads will proportionally impact all land cover types in the Reserve System</li> </ul>
New vehicle bridges	<ul style="list-style-type: none"> <li>Temporary land cover impacts are equal to permanent impacts</li> <li>Multiply the width of each crossing by the number of crossings to get the total linear ft of temporary stream impact</li> </ul>	<ul style="list-style-type: none"> <li>“Bridges” includes all types of vehicle crossings including culverts</li> <li>An area equal to permanent impact is assumed for temporary construction impacts</li> <li>Assume 0.5 bridges every 5 years; 5 total;</li> <li>Assume 8 ft wide, and 39 ft long (based on average bridge width and length for County Parks bridges)</li> <li>Temporary stream impacts are assumed to equal the width of the crossing</li> </ul>

Table 4-5h. Continued

Covered Activity	Method of Impact Estimation	Key Assumptions <sup>1, 2, 3</sup>
Vehicle bridge replacement	<ul style="list-style-type: none"> <li>• Temporary land cover impacts are equal to permanent impacts</li> <li>• Multiply the width of each crossing by the number of crossings to get the total linear ft of temporary stream impact</li> </ul>	<ul style="list-style-type: none"> <li>• “Bridges” includes all types of vehicle crossings including culverts</li> <li>• An area equal to permanent impact is assumed for temporary construction impacts</li> <li>• Assume 1 bridge replacements every 5 years; 10 total</li> <li>• Assume replacement bridges are 2 ft wider than existing culverts and 39 ft long</li> <li>• Temporary stream impacts are assumed to equal the width of the crossing</li> </ul>
Trail bridges	<ul style="list-style-type: none"> <li>• Temporary land cover impacts are equal to permanent impacts</li> <li>• Multiply the width of each crossing by the number of crossings to get the total linear ft of temporary stream impact</li> </ul>	<ul style="list-style-type: none"> <li>• An area equal to permanent impact is assumed for temporary construction impacts</li> <li>• Assume 2.5 bridges every 5 years; 25 total;</li> <li>• Assume 8 ft wide and 39 ft long (based on average bridge width and length for County Parks bridges)</li> <li>• Temporary stream impacts are assumed to equal the width of the crossing</li> </ul>
Trails	<ul style="list-style-type: none"> <li>• Multiply permanent impacts by 10%</li> </ul>	<ul style="list-style-type: none"> <li>• Assume construction impacts are equal to 10% of the project footprint</li> <li>• Assume that trails will proportionally impact all land cover types in the Reserve System</li> </ul>
Trailhead facilities	<ul style="list-style-type: none"> <li>• Approximately 10*475*4 sq ft per facility</li> <li>• Multiply by number of facilities</li> <li>• Convert to acres</li> <li>• Distribute acres of impact</li> </ul>	<ul style="list-style-type: none"> <li>• Assume 1 trailhead facility per 5,000 acres of Reserve System</li> <li>• Assume a 10 ft buffer around a 5 acre footprint will be affected; 5 square acres is approximately 475 ft by 475 ft</li> <li>• Assume that trailhead facilities will be sited on grassland land cover</li> </ul>

<sup>1</sup> All impact analyses are based on the baseline land cover as described in Chapter 4. Additional land cover parameters are identified in the Key Assumptions column.

<sup>2</sup> Unless otherwise noted, impacts to Urban-suburban, developed agriculture, landfill, and reservoir were excluded from final impact numbers because these land covers are assumed to either not provide any habitat value or will not be impacted in such a manner as to require conservation or mitigation (for the reservoir land cover).

<sup>3</sup> When using the method of impact distribution proportional to land cover, it is assumed that a project is likely to impact land covers in the same proportion at which land covers exist in a given project area. This approach may skew impacts higher for sensitive land covers that can be avoided through application of conditions on covered activities, design, and project siting, and skew impacts lower for impacts to less sensitive land covers that may be utilized in favor of impacting more sensitive land covers. Nonetheless, this impact analysis was conducted assuming any land cover can be impacted so long as it is not protected or excluded for other reasons (identified in the baseline data description).

**Note:** This table of impact analysis methods and key assumptions is not intended to be all inclusive of all covered activities. Rather, this table shows how impacts were calculated for covered activities that have impacts significant enough to be estimated. Minor activities described in Chapter 2 are covered under this Plan even though they may not appear in this table.

**Table 4-6.** Covered Plant Occurrences and Estimated Permanent Impacts from Covered Activities

Species Name	Number of Extant Occurrences in California <sup>1</sup>	Number of Known Occurrences in Study Area <sup>1,2</sup>	Study Area Occurrences in Type 1 Open Space <sup>3</sup>	Study Area Occurrences in Type 1, 2, or 3 Open Space <sup>3</sup>	Permanent Impact Limit if No Additional Occurrences Found <sup>4</sup>	Impact Proportion on Known Study Area Occurrences (%)	Total Permanent Impact Limit if Additional Occurrences are Found and Protected in Study Area <sup>5</sup>
Tiburon Indian paintbrush	9	2	0	2	0 <sup>6</sup>	N/A	0
Coyote ceanothus	3	3	0	2	0 <sup>7</sup>	N/A	0
Mt. Hamilton thistle	48	40	2	15	6	15%	8
Santa Clara Valley dudleya	209	207	2	72	11	5%	14
Fragrant fritillary	59	8	0	4	1	13%	3
Loma Prieta hoita	26	14	1	10	0	0%	2
Smooth lessingia	39	39	3	18	6	15%	9
Metcalf Canyon jewelflower	11	10	1	3	2	20%	2
Most beautiful jewelflower	86	39	3	22	6	15%	8
<b>Total</b>	<b>490</b>	<b>362</b>	<b>12</b>	<b>148</b>	<b>32</b>	<b>9%</b>	<b>46</b>

Notes:

<sup>1</sup> Includes all CNDDB occurrences except those classified as "extirpated." See Chapter 3 and Chapter 5 for a complete list of data sources.

<sup>2</sup> For the purposes of this Plan and the analyses, occurrences are equivalent to populations for all species except for Mt. Hamilton thistle, Santa Clara Valley dudleya, and smooth lessingia. Populations may be redefined during implementation based on field monitoring and other data.

<sup>3</sup> Occurrences that are only partially in open space are not included in totals.

<sup>4</sup> This column provides the limit of impacts by number of occurrences allowable under the Habitat Plan. Impact is defined as a permanent loss of an entire occurrence or a partial loss that results in a reduction of viability (as further described in Chapter 6, Condition 20). See text for methods to determine whether partial impacts to an occurrence will be counted against the impact limit. The impact limit assumes that no new occurrences of the species are discovered during the permit term and that occurrences impacted are in worse condition than those protected within reserves (See Section 5.3.1. for a discussion on incorporating covered plant species into the Reserve System). Impact limits were determined based on estimated impacts of covered activities. In some cases, impacts were capped to ensure regulatory standards are met.

<sup>5</sup> Impact limits in this column are the total allowable impacts if additional natural occurrences (i.e., not created populations) are discovered and protected in reserves. Protected occurrences must be of higher conservation value than impacted occurrences. New occurrences must be found and protected before impacts occur. See Chapter 5 and Table 5-16 for protection ratios that must occur in order for impact limits to be increased.

<sup>6</sup> Loss of a population of this species is not allowed or needed due to covered activities. Impact is allowed to a portion of one population due to management actions within the Reserve System (e.g., prescribed burning) or inadvertent trampling due to livestock grazing.

<sup>7</sup> Impacts are allowed to no more than 3,650 individuals or 5% of the individuals in the population adjacent to Anderson Dam, whichever is smaller.

**Table 4-7. Assumptions of Land Cover Imperviousness**

Land Cover Type	Impervious Assumption <sup>1</sup>
California Annual Grassland	1
Non-serpentine native grassland (not mapped)	n/a
Serpentine Bunchgrass Grassland	1
Serpentine Rock Outcrop / Barrens	100
Serpentine Seep	0
Rock Outcrop	100
Northern Mixed Chaparral / Chamise Chaparral	1
Mixed Serpentine Chaparral	1
Northern Coastal Scrub / Diablan Sage Scrub	1
Coyote Brush Scrub	1
Valley Oak Woodland	1
Mixed Oak Woodland and Forest	1
Blue Oak Woodland	1
Coast Live Oak Forest and Woodland	1
Foothill Pine - Oak Woodland	1
Mixed Evergreen Forest	1
Willow Riparian Forest and Scrub	1
Central California Sycamore Alluvial Woodland	1
Mixed Riparian Forest and Woodland	1
Redwood Forest	1
Ponderosa Pine Woodland	1
Knobcone Pine Forest	1
Coastal and Valley Freshwater Marsh	0
Seasonal Wetland	0
Pond	0
Reservoir	0
Orchard	2
Vineyard	10
Grain, row-crop, hay and pasture, disked/ short-term fallowed	2
Agriculture developed / Covered Ag	70
Urban - Suburban	35
Rural - Residential	10
Golf Courses / Urban Parks	3
Landfill	20
Ornamental Woodland	1
Barren	1
Streams (miles)	0
<b>Total</b>	

<sup>1</sup> In a range of 0 (least impermeable) to 100 (most impermeable). Based on Center for Watershed Protection imperviousness classifications for land cover.



### Table 4-8. Results of Impervious Surface Analysis

	Acres in Study Area	Est. Current Impervious Surfaces (acres)	Est. Current Impervious Surfaces (%)	Est. Impervious Surfaces at Buildout (acres)	Est. Impervious Surfaces at Buildout (%)	Est. Change (acres)	Est. Change (%)
Watershed and sub-watershed							
<b>Study Area</b>	460,205.4	38,381.8	8.3%	44,105.4	9.6%	5,724	14.9%
<b>San Francisco Bay Watershed</b>							
Coyote sub-watershed							
Above Anderson Dam	86,188	1,125	1.3%	1,383	1.6%	258	22.9%
Below Anderson Dam	91,496	12,531	13.7%	14,016	15.3%	1,485	11.8%
Guadalupe sub-watershed							
Above Guadalupe, Almaden, and Calero Dams	6,363	92	1.5%	139	2.2%	47	50.9%
Below Guadalupe, Almaden, and Calero Dams	52,438	13,585	25.9%	14,041	26.8%	456	3.4%
<b>Monterey Bay Watershed</b>							
Llagas sub-watershed							
Above Chesbro Dam	12,234	164	1.3%	227	1.9%	62	38.0%
Below Chesbro Dam	53,131	6,017	11.3%	8,499	16.0%	2,481	41.2%
Pacheco sub-watershed							
Above Pacheco Dam	26,048	274	1.1%	277	1.1%	3	1.1%
Below Pacheco Dam	53,591	674	1.3%	687	1.3%	13	2.0%
Uvas sub-watershed							
Above Uvas Dam	19,441	251	1.3%	276	1.4%	24	9.7%
Below Uvas Dam	36,379	1,224	3.4%	2,027	5.6%	803	65.6%
<b>Note:</b> This analysis assumes that all interim projects (those projects entitled for development in advance of Plan implementation) that are located inside the planning limits of urban growth will be developed to the equivalent of the urban-suburban land cover type and that all interim projects located outside the planning limit of urban growth will be developed to the equivalent of the rural-residential land cover type.							

**Table 4-9. Estimated Impacts to Critical Habitat**

Species and Habitat Type	Total Critical Habitat in Study Area (acres)	Permanent Impact to Critical Habitat from Covered Activities (acres)	Proportion (%)	Temporary Impact to Critical Habitat from Covered Activities (acres)	Proportion (%)
<b>Bay Checkerspot Butterfly</b>					
Estimated Modeled Habitat overlapping Critical Habitat	7,616	<300 <sup>1, 2</sup>	4%	49	<1%
Estimated Critical Habitat outside Modeled Habitat <sup>3</sup>	8,985	437 <sup>4</sup>	49%	76	<1%
Maximum Allowable Impact to Total Critical Habitat	16,601	<550 <sup>2</sup>	3%	86 <sup>5</sup>	<1%
<b>California Tiger Salamander</b>					
Estimated Modeled Breeding Habitat overlapping Critical Habitat	92	1	1%	0	<1%
Estimated Modeled Non-Breeding Habitat overlapping Critical Habitat	27,235	263	1%	119	<1%
Estimated Critical Habitat outside Modeled Habitat <sup>3</sup>	769	8	1%	6	<1%
Maximum Allowable Impact to Total Critical Habitat	28,096	272	1%	125	<1%
<b>California Red-Legged Frog</b>					
Estimated Modeled Primary Habitat overlapping Critical Habitat	2,964	21	<1%	11	<1%
Estimated Modeled Secondary Habitat overlapping Critical Habitat	146,452	1,002	<1%	265	<1%
Estimated Critical Habitat outside Modeled Habitat <sup>3</sup>	1,546	12	<1%	5	<1%
Maximum Allowable Impact to Total Critical Habitat	150,962	1,035	<1%	277 <sup>5</sup>	<1%

Notes:

<sup>1</sup> Allowable permanent impact to Bay checkerspot butterfly critical habitat is capped below the estimated impact to account for the cap on impacts to Bay checkerspot butterfly modeled habitat in this Plan. This acreage is a cap, not an estimate.

<sup>2</sup> Impacts to modeled primary Bay checkerspot butterfly habitat are capped at 300 acres and impacts to serpentine bunchgrass grassland are capped at 550 acres.

<sup>3</sup> "Critical Habitat outside Modeled Habitat" is critical habitat area that does not overlap with habitat modeled for the Plan. Critical habitat is identified separately from modeled habitat because critical habitat is a relatively broad estimation based on "physical or biological features that are essential to the conservation of the species... if those features may require special management considerations or protection" (73 FR 50417). The modeling conducted for this Plan was done at a finer resolution than the critical habitat designation.

<sup>4</sup> Impacts to Bay checkerspot butterfly critical habitat could occur outside of modeled habitat on land cover types without impact caps. As such, allowable impacts to critical habitat outside of modeled habitat may be higher than allowed on modeled habitat. The cumulative cap on critical habitat is 550 acres.

<sup>5</sup> Allowable temporary impact to Bay checkerspot butterfly critical habitat and California red-legged frog critical habitat is capped below the estimated impact to hold impact levels constant with the Public Draft. Temporary impacts increased slightly due to the re-allocation of impacts to other locations in the study area due to the removal of State Parks lands from the impact analysis. This acreage is a cap, not an estimate.

Data sources: U.S. Fish and Wildlife Service 2005 (California tiger salamander), 2008 (Bay checkerspot butterfly), 2010 (California red-legged frog).

## Legend

- Habitat Plan Study Area
- County Boundary
- Rural Residential Development Zone Boundary
- Major Roads
- Reservoirs
- Planning Limit of Urban Growth

5 2.5 0 5 10 Miles

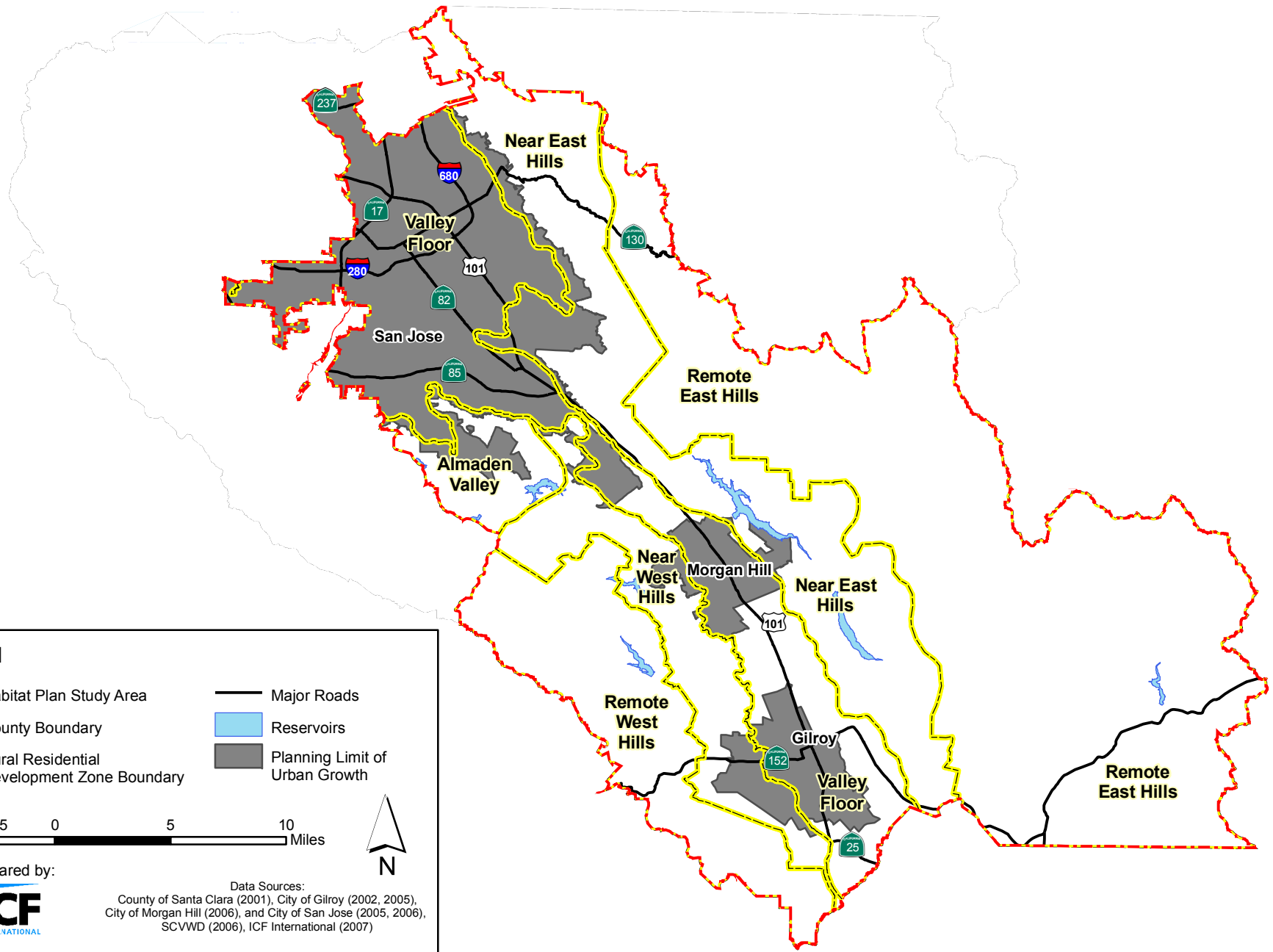


Prepared by:



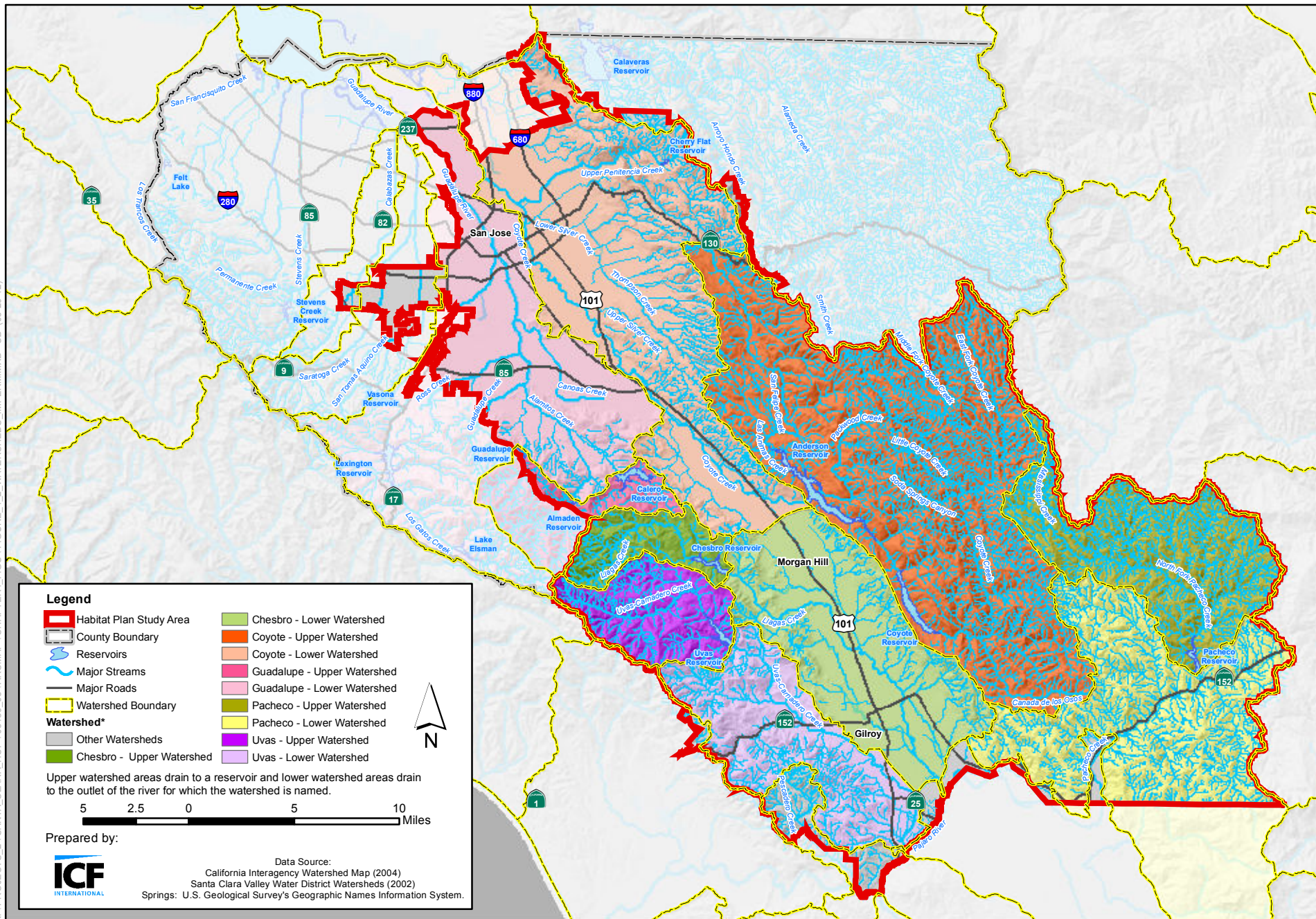
Data Sources:

County of Santa Clara (2001), City of Gilroy (2002, 2005),  
City of Morgan Hill (2006), and City of San Jose (2005, 2006),  
SCVWD (2006), ICF International (2007)

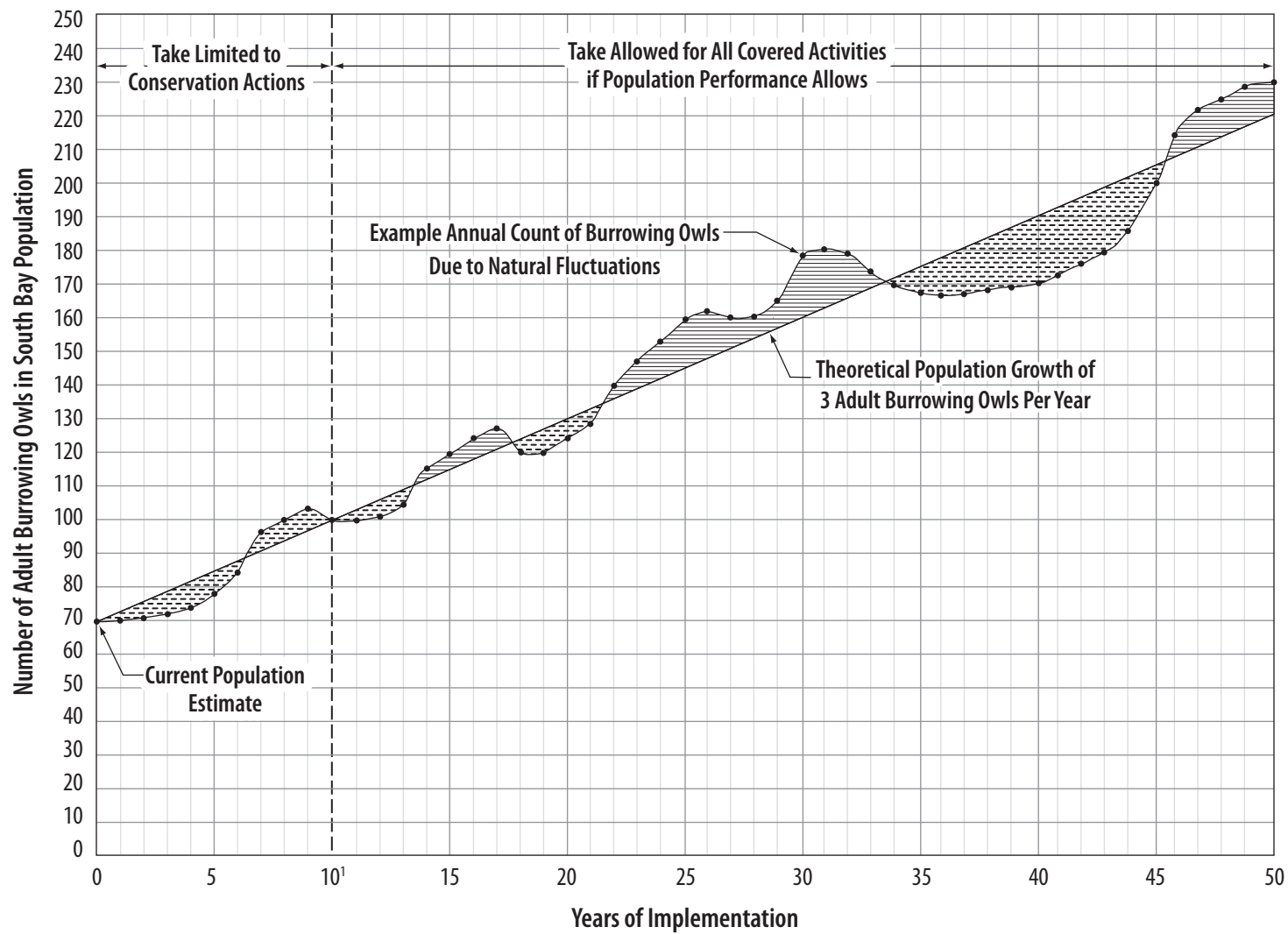


**Figure 4-1**  
**Rural Development Zones Used in the Impact Analysis**



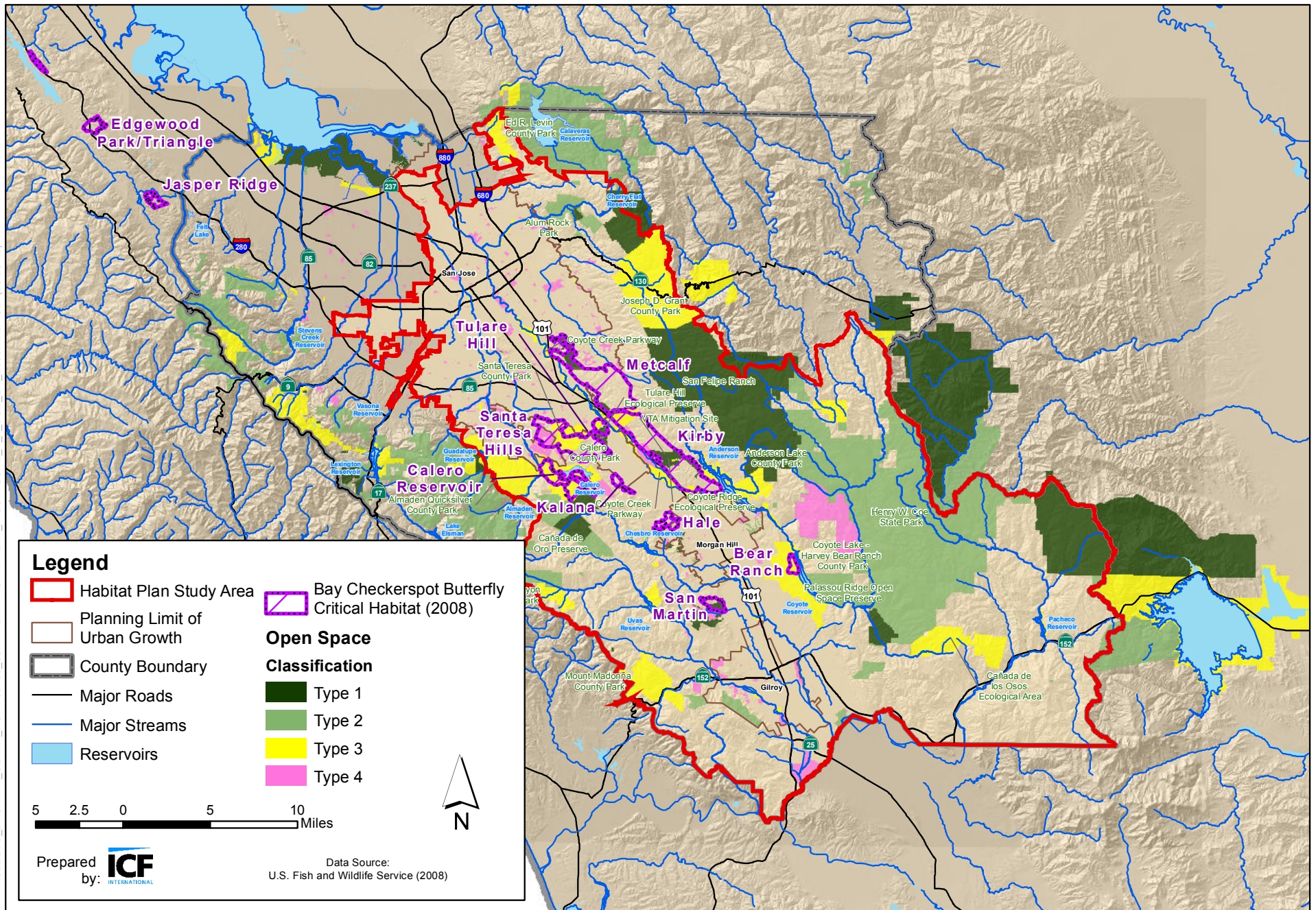


**Figure 4-2**  
**Habitat Plan Watersheds Assessed for Impervious Surface Analysis**



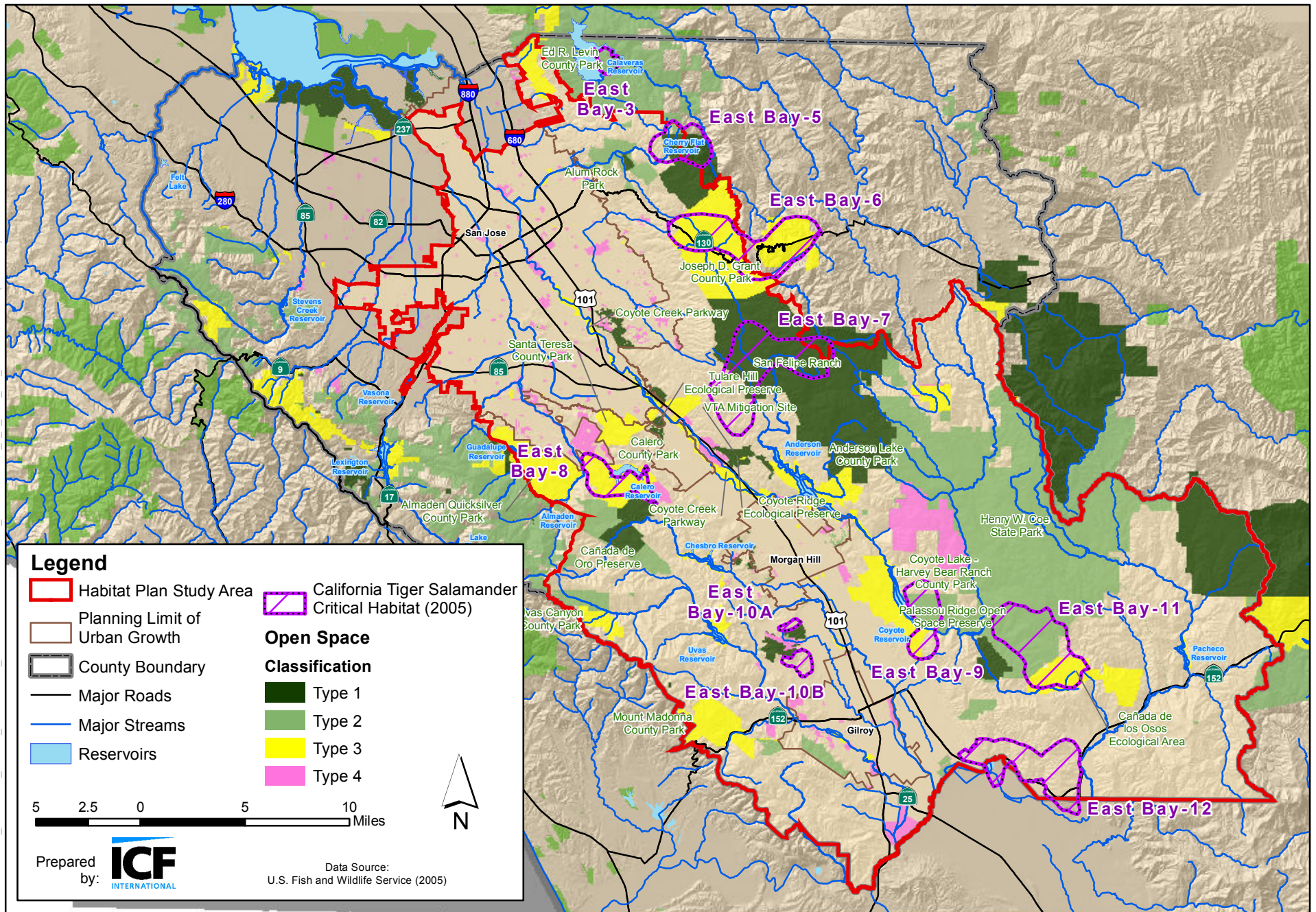
1. No take will occur before year 10 except when related to conservation actions.





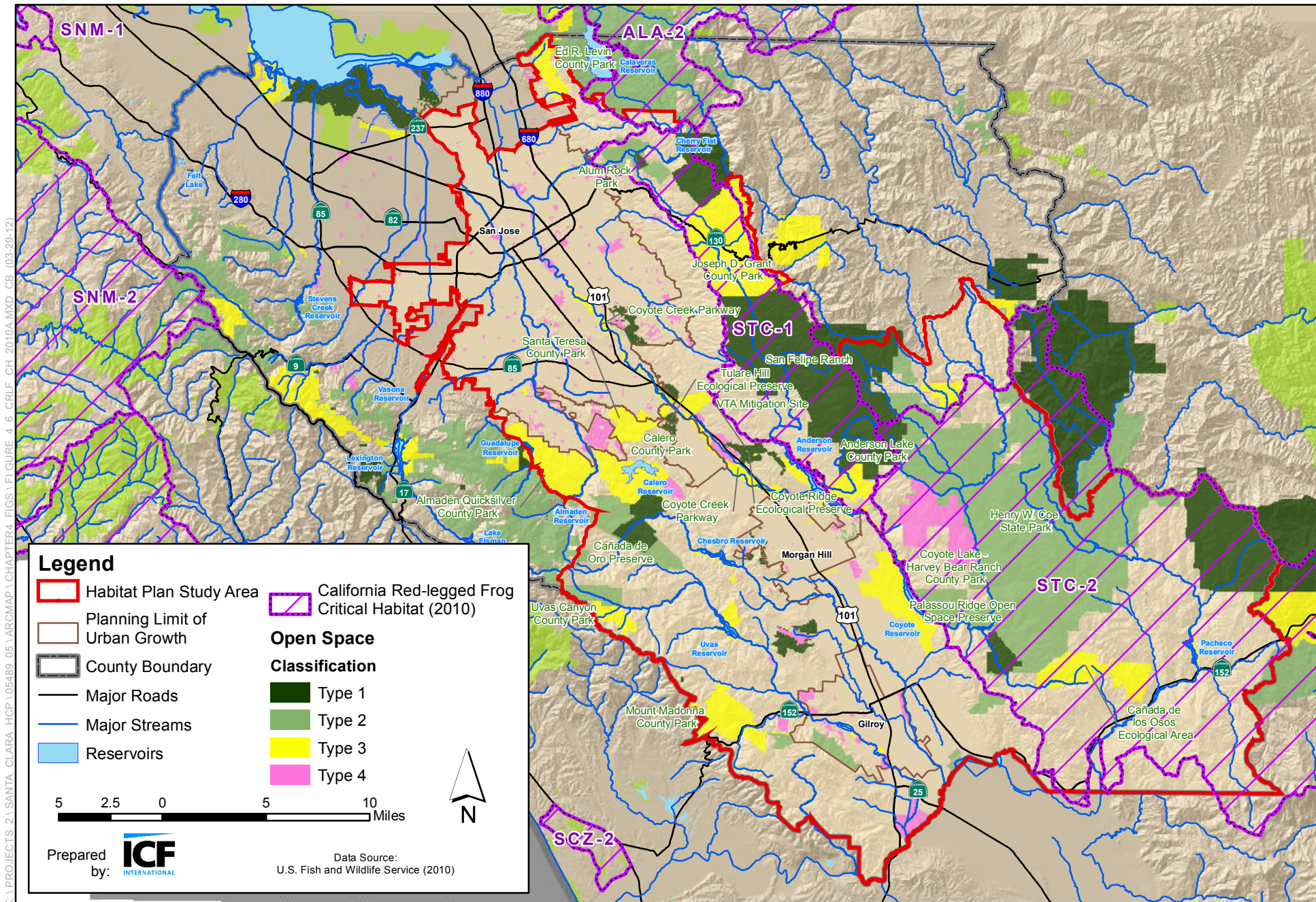
**Figure 4-4**  
**Bay Checkerspot Butterfly Critical Habitat within the Study Area**





**Figure 4-5**  
**California Tiger Salamander Critical Habitat within the Study Area**





**Figure 4-6**  
**California Red-legged Frog Critical Habitat within the Study Area**



## Chapter 5

# Conservation Strategy

### 5.1 Summary

The conservation strategy was designed to meet the regulatory requirements of ESA and the NCCP Act and to streamline compliance with CEQA, NEPA, and other applicable environmental regulations (see discussion in Chapter 1). The conservation strategy provides mitigation for impacts on covered species on the basis of species and habitat needs. The conservation strategy mitigates all of the impacts described in Chapter 4, including direct, indirect, temporary, and permanent impacts. To meet the NCCP Act permit standards, the conservation strategy also contributes to species recovery to help to delist the listed species and prevent the listing of non-listed species through the protection, restoration, and enhancement of natural communities and species habitat. The conservation strategy also achieves the objectives listed below, pursuant to the NCCP Act (Section 2820).

- Conserves, restores, and provides for the management of representative natural and semi-natural<sup>1</sup> landscapes.
- Establishes reserves that provide conservation of covered species within the study area (i.e., contributes to species recovery) and linkages to adjacent habitat outside the study area.
- Protects and maintains habitat areas that are large enough to support sustainable populations of covered species.
- Incorporates in the reserves a range of environmental gradients and high habitat diversity to provide for shifting species distributions in response to changing circumstances.
- Sustains the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the Reserve System.

Because the conservation strategy achieves the standards of the NCCP Act to contribute to species recovery, the strategy therefore exceeds the mitigation standards of the ESA. The conservation strategy is based on the best scientific data available at the time of its preparation and takes into account the limitations of the baseline data available for the study area (see Chapter 3 and **Appendix D**).

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<sup>1</sup> A semi-natural landscape is defined as one that is disturbed by human activity but still provides important habitat for a variety of native species.

The conservation strategy is born out of the biological goals and objectives developed for the Plan and described below. To achieve these goals and objectives, a series of conservation actions have been developed that often meet multiple objectives or goals. The chapter is focused on conservation actions that will accomplish the following.

- Create a Reserve System by Year 45 of the permit term that will preserve a minimum of 33,205 acres and an estimated 33,629 if all impacts occur of newly acquired land for the benefit of covered species, natural communities, biological diversity, and ecosystem function.
- In addition to newly acquired land, incorporate 13,291 acres of existing open space into the Reserve System to enhance their long-term management.<sup>2</sup> The total size of the Reserve System will be at least 46,496 acres and up to an estimated 46,920 acres.
- Protect 100 miles of streams.
- Preserve major local and regional connections between key habitat areas and between existing protected areas.
- Establish a framework for long-term management of the Reserve System and streams throughout the permit area to enhance populations of covered species and maintain biological diversity.
- Restore minimum of 70 acres and up to 428 acres of riparian woodland and wetlands to offset losses of these land cover types and contribute to species recovery. All restoration construction will be completed by Year 40.
- Create a minimum of 20 acres and up to 72 acres of ponds to offset losses and contribute to species recovery. All creation construction will be completed by Year 40.

All of these actions will be accomplished by the Implementing Entity with partnerships with the Permittees, Santa Clara County Open Space Authority, landowners, possibly non-profit land conservation organizations, mitigation banks, and the state and federal government (see Chapter 9 for funding and land acquisition partnerships). This chapter does not describe avoidance and minimization actions; these and all other conditions on covered activities are addressed in Chapter 6.

## 5.2 Framework

The conservation strategy was designed using a multi-scale approach in accordance with principles of conservation biology. At the largest scale, biological goals and objectives were developed to encompass ecological

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<sup>2</sup> This is the maximum acreage of existing open space that would be credited toward the Reserve System size under the Plan. Additional acres of existing open space could be incorporated into the Reserve System; however, they would not receive credit toward the Reserve System size. Alternatively, the Implementing Entity may acquire new lands for the Reserve System in place of adding this acreage from existing open space, as long as the total Reserve System size requirements are met.

processes, environmental gradients, biological diversity, and regional wildlife linkages. Conservation actions were developed to implement these goals and objectives. These conservation actions occur at the *landscape level*, generally at the scale of miles or tens of miles. At the middle level, conservation actions were developed to address natural communities primarily through the enhancement, restoration, and management of vegetation types (i.e., land cover types). This medium scale is called the *natural community level*. The final level addresses the specific needs of covered species for protection and enhancement of individuals, populations, and groups of populations. *Species-level* conservation actions were developed to supplement and focus actions developed at the broader levels and to ensure that all the needs of particular species are addressed.

This framework for the conservation strategy follows the multi-scale structure and approach advocated by Hunter (2005) that combines “coarse filter conservation,” “meso-filter conservation,” and “fine-filter conservation” (see **Figure 5-1**).

The conservation actions are described in Section 5.3 *Conservation Actions*; they are divided into land acquisition actions and actions at the natural community and species levels. All conservation actions are designed to have enough detail and specificity to allow implementation. Because of the large scale of this Plan and its long timeframe, actions are also designed to be flexible. For example, natural community-level actions provide broad management guidelines and principles such that future land managers can implement specific techniques on the ground that are best suited to site conditions. Preserving this flexibility is an important part of the conservation strategy.

Implementation of many actions will require the preparation of site-specific implementation documents. These plans will be prepared during Plan implementation after land is acquired and specific restoration and management needs are determined. Reserve unit management plans will guide activities within specific reserve units. Reserve units are defined as groups of contiguous or neighboring parcels that have similar natural communities, covered species, and infrastructure and therefore similar management issues. Reserve unit management plans for individual reserve units will be completed within 5 years of the first acquisition (fee title or easement) of the land for that reserve unit and submitted to the Wildlife Agencies for review and approval.

All conservation actions will be implemented using an adaptive management approach that is closely tied to long-term monitoring (see Chapter 7 *Monitoring and Adaptive Management Program*).

## 5.2.1 Biological Goals and Objectives

The Implementing Entity will achieve landscape, natural community, and species-level goals and objectives. Goals are broad, guiding principles based on the conservation needs of the resources. Biological objectives are expressed as

conservation targets or desired conditions. Objectives are measurable and quantitative when possible; they clearly state a desired result and will collectively achieve the biological goals **Figure 5-2**). Biological goals for covered species are required by USFWS's *5-Point Policy* to be included in HCPs (65 FR 35242, June 1, 2000)<sup>3</sup>.

All the biological goals and objectives on which this Plan is based are presented in **Tables 5-1a through 5-1d**. The conservation actions in this chapter contain detailed information on all aspects of reserve acquisition and management. They provide a strategy for how the goals and objectives will be achieved. It is expected that many of the details of the conservation actions will be modified during Plan implementation through the monitoring and adaptive management program, while goals and objectives will remain relatively static.

The 21 biological goals and 94 objectives in **Table 5-1** are organized by level: landscape level (**Table 5-1a**), natural community level (**Table 5-1b**) and species level (**Tables 5-1c and 5-1d**). At the species level, wildlife and plants are separated in order to make the tables more accessible. The 135 conservation actions that were designed to achieve each objective are shown in **Tables 5-2a and 5-2b**. **Table 5-2a** lists sequentially all land acquisition actions; **Table 5-2b** lists all management actions, broadly defined. One conservation action may contribute to multiple objectives or goals.

In some cases, conservation actions include the phrase “biologically appropriate” or “biologically feasible”. These phrases were added to conservation actions such as plant occurrence creation (see Section 5.3.1 subheading *Incorporating Covered Plant Species* for the definition of a plant occurrence) that are highly dependent on site conditions and other ecological contexts. These conservation actions will be implemented unless the Implementing Entity, with the concurrence of the Wildlife Agencies, determines based on further evaluation that the action is not biologically appropriate or biologically feasible but the biological goals of the Plan would still be fulfilled by implementing a more effective conservation action.

If the agreed upon conservation actions cannot be implemented and there are no alternatives that provide similar benefit and will achieve the biological goals, as agreed to by the Wildlife Agencies and the Implementing Entity, then coverage of the target species may need to be modified, reduced, or eliminated according to the process described in Chapter 10, Section 10.3 *Modifications to the Plan*.

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<sup>3</sup> Due to the scope of this Plan, it was not possible to develop biological goals and objectives that strictly adhered to the Service's and NMFS' 5-Point Policy requirements as described in 65 FR 35251. That is, despite best efforts, the scope of the Plan precluded the Applicants from developing biological objectives that in all instances included species or habitat indicators, locations, actions, quantify/state, and timeframe. This information is presented in this chapter, which will be supplemented by implementation plans that will be reviewed and approved by the Wildlife Agencies (i.e., reserve unit management plans).

## Process of Developing Biological Goals and Objectives

The biological goals and objectives were initially developed through a series of six workshops composed of key technical staff from ICF Jones & Stokes, experts from the Wildlife Agencies, biologists and species experts from SCVWD, Local Partner staff, and outside species experts.

The purpose of each workshop was to collaboratively develop working draft biological goals and objectives. Each workshop began with an overview of the relevant natural communities and species, including key threats, ecological needs, and issues for the conservation strategy (e.g., potential conflicts with other species) by technical experts. Participants then worked through a set of preliminary draft goals and objectives developed by ICF and provided to participants prior to the workshop. Follow-up web-based conference calls or meetings were held at least once for every workshop to refine the goals and objectives to a point where all meeting participants were satisfied.

Every effort was made to create biological objectives that were quantitative as well as measurable. Workshop participants acknowledged that quantitative biological objectives may be somewhat subjective, but at least these quantitative objectives are explicit, clear, and transparent, and they serve as a starting point for conservation actions in the study area, including adaptive management and compliance monitoring (Margules and Pressey 2000).

Goals and objectives were frequently refined and updated as new analysis or new information was developed. In some cases, several possible quantitative targets emerged for an objective. These were carried forward as alternative approaches to meeting the same goal, and formed the basis for the alternative conservation strategies that preceded the selected conservation strategy. Biological goals and objectives were developed using the primary sources listed below.

- Ecological data from species accounts (**Appendix D**) and natural community descriptions (Chapter 3).
- Existing conservation targets or management recommendations for covered species in state or federal recovery plans or status reviews (Hays et al. 1999; U.S. Fish and Wildlife Service 1998a, 1998b, 1998c, 2002, 2006a).
- Other sources with conservation targets or conservation recommendations that address the covered species or the study area (Harrison et al. 1988; Weiss 1999; California Partners in Flight 2002; Klute et al. 2003; Ehrlich and Hanski 2004; Haight et al. 2004; Riparian Habitat Joint Venture 2004; Hamilton 2004; Trenham and Shaffer 2005; The Nature Conservancy 2006a).
- Critical habitat maps and data in published critical habitat rules for covered species (U.S. Fish and Wildlife Service, 2005, 2006b, 2008, 2010).
- Habitat distribution models developed for most of the covered species (see Chapter 3 and **Appendix D**).
- Results of the conservation gap analysis (see below).

- Input from resource specialists outside workshops including staff from the Wildlife Agencies.

When developing quantitative objectives, workshop participants recognized that conservation encompasses both mitigation and the need to contribute to species recovery. The level of this contribution to recovery was based, in part, on the proportion of the species' range within the study area. Quantitative biological objectives were established on the basis of relevant species-specific data. When data were not available, general guidelines or conservation "rules of thumb" were used to help establish quantitative biological objectives on the basis of the proportion of the species' current range within the study area (Margules and Pressey 2000) (**Table 5-3**).

Conservation of ecological processes, environmental gradients, regional biological diversity, and regional wildlife linkages were addressed primarily in the landscape-level biological goals and objectives. These goals and objectives were inherently difficult to develop because of the large scale of the processes and the general lack of data regarding their operation in the study area. The land cover mapping described in Chapter 3 was assumed to be an adequate surrogate for regional biological diversity. If adequate and representative stands of all of these land cover types are preserved and enhanced, it is assumed that native biological diversity in general will be preserved and enhanced.

## Biological Goals

Most of the biological goals and objectives are designed at least to conserve current populations of covered and other native species in the study area. In some cases, populations of covered species are expected to increase as a result of land preservation, improved water management, habitat enhancement, habitat restoration, and habitat creation.

Goals are listed below by level (see **Tables 5-1a through 5-1d**): landscape level, natural community level, and species level. The biological goals apply only to the Reserve System unless stated otherwise. Though most conservation actions will occur within the Reserve System, similar conservation approaches on private lands outside of the Reserve System will be encouraged during implementation. In cases where species conservation will occur outside the Reserve System (e.g., stream and riparian restoration), biological goals apply to the study area as a whole.

### Landscape-Level Goals (Table 5-1a)

- **Goal 1a.** Protect and maintain natural and semi-natural landscapes.
- **Goal 1b.** Protect and maintain ecological (natural) processes.
- **Goal 2.** Maintain or improve opportunities for movement and genetic exchange of native organisms within and between natural communities inside and connecting to areas outside the study area.

- **Goal 3.** Enhance or restore representative natural and semi-natural landscapes to maintain or increase native biological diversity.

### **Natural Community-Level Goals (Table 5-1b)**

- **Goal 4.** Maintain and enhance functional grassland communities that benefit covered species and promote native biodiversity.
- **Goal 5.** Maintain and enhance functional chaparral and northern coastal scrub communities to benefit covered species and promote native biodiversity.
- **Goal 6.** Maintain and enhance functional oak woodland communities to benefit covered species and promote native biodiversity.
- **Goal 7.** Maintain and enhance functional conifer woodland communities to benefit covered species and promote native biodiversity.
- **Goal 8.** Improve the quality of streams and the hydrologic and geomorphic processes that support them to maintain a functional aquatic and riparian community to benefit covered species and promote native biodiversity.
- **Goal 9.** Maintain a functional riparian forest and scrub community at a variety of successional stages and improve these communities to benefit covered species and promote native biodiversity.
- **Goal 10.** Maintain, enhance, and create or restore functional pond, freshwater perennial wetland, and seasonal wetland habitats that benefit covered species and promote native biodiversity.

### **Species-Level Goals (Tables 5-1c and 5-1d)**

- **Goal 11.** Improve the viability of existing Bay checkerspot butterfly populations, increase the number of populations, and expand the geographic distribution to ensure the long-term persistence of the species in the study area.
- **Goal 12.** Not used.
- **Goal 13.** Increase the size and sustainability of the breeding population and increase the distribution of breeding and wintering burrowing owls in the study area.
- **Goal 14.** Increase the ability of San Joaquin kit fox to move into and within the study area and provide habitat to increase the likelihood of breeding.
- **Goal 15.** Provide for the expansion of a breeding population of least Bell's vireos into the study area and increase reproductive success of least Bell's vireo.
- **Goal 16.** Conserve existing populations of the foothill yellow-legged frog population where possible and increase the overall population of foothill yellow-legged frog in biologically appropriate locations in the study area.

- **Goal 17.** Conserve existing populations of California red-legged frog, California tiger salamander, and western pond turtle where possible, and increase the number of individuals and expand the overall distribution of populations of these species in biologically appropriate locations within the study area to maintain viable populations and contribute to the regional recovery of these species.
- **Goal 18.** Increase the population size of tricolored blackbird to enhance the viability of the species in the study area.
- **Goal 19.** Not used.
- **Goal 20.** Maintain viability, protect, and increase the size and number of populations of covered serpentine plant species, including Coyote ceanothus, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, fragrant fritillary, Mt. Hamilton thistle, Loma Prieta hoita, and Tiburon paintbrush, within the study area.
- **Goal 21.** Protect and increase the size and number of Loma Prieta hoita within the study area.

## 5.2.2 Avoidance and Minimization Measures

As required by ESA, the Plan includes measures to avoid or minimize the impact of the taking of covered species. The primary focus of these measures is to avoid or minimize take of *individuals* of covered species (i.e., death or injury to species) and of high-quality habitat, such as streams and riparian areas that may be affected by covered activities. Others forms of take (e.g., harm or harassment of covered species) will still occur.

For example, an intent of certain measures is to encourage individuals of covered wildlife species to avoid or escape project construction zones. Occurrences of covered plants will also be avoided when adequate conservation of these species is not available within the Habitat Plan Reserve System. Activities within streams will be carefully designed and implemented to minimize their effects on this important resource and habitat for covered species. Impacts will also be minimized by requiring development projects adjacent to the Reserve System to be designed in ways that reduce their impacts on covered species and natural communities (as described in Chapter 6).

Areas designated for conservation and described in this chapter include substantial amounts of high-quality habitat for covered species and of natural communities, as well as areas important for maintaining regional biological diversity. Covered activities that result in permanent impacts are anticipated to occur primarily in areas with low-quality habitat. This *regional avoidance and minimization approach* to conservation of land cover and species habitat reduces the need to avoid or minimize impacts on habitats at the small or project scale. Avoidance and minimization measures at the landscape level are accordingly built into the Plan. Most habitat preservation and enhancement will be concentrated away from covered activities in the high-quality habitat of the



proposed Reserve System. Avoidance and minimization measures that apply to covered activities are described in detail in Chapter 6.

### 5.2.3 Reserve System

Land preservation is an important component of this conservation strategy. The term *land preservation* is intended broadly to specify the acquisition of terrestrial and aquatic land cover types. Land will be acquired from willing sellers in fee title or through establishment of conservation easements to create the Habitat Plan Reserve System. Land acquisition mechanics and processes are described in more detail in the Section 5.3.1 *Land Acquisition and Restoration Actions*. In order to become part of the Reserve System, lands must:

1. be consistent with the conservation strategy described in this chapter;
2. be approved by the Implementing Entity and Wildlife Agencies; and
3. be protected with a conservation easement<sup>4</sup> (see Chapter 8 for additional information).

Because management of riparian and stream land cover types takes place both inside and outside the Reserve System, specific acquisition and management priorities related to aquatic habitat are described in Section 5.2.4 *Aquatic Habitat Protection and Enhancement*.

## Reserve Design Process

The process for delineating and prioritizing land for acquisition corresponds to the scalar approach of the conservation actions (landscape-level, natural community-level, and species-level). First, consideration was given to large, core reserves that could accommodate large blocks of key land cover types (e.g., serpentine grassland) and covered species with large geographical ranges and specific habitat needs (e.g., areas with high densities of ponds to accommodate covered amphibians and reptiles). This level of design also considered expanding existing open space to create larger core reserves. Linkages were also considered so that habitat connectivity goals and objectives could be met (see discussion below). Next, the conservation of rare land cover types (e.g., serpentine seeps and rock outcrops) was considered. Finally, the conservation of species with small ranges was considered (e.g., covered plants). For resources not protected by the core reserves or the habitat linkages, smaller, “satellite” reserves will be proposed when necessary to protect isolated but important resources such as occurrences of covered plants and rare land cover types. In all cases, the Reserve System was designed to adhere to the reserve design principles discussed below with the least amount of acreage in order to efficiently achieve the conservation targets.

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<sup>4</sup> The exception to the conservation easement requirement is existing lands listed in **Table 5-5** and owned by the Open Space Authority. See Chapter 9 for details.

Land use and economic factors in the Reserve System design were also considered in a step-wise manner. The first draft maps of the proposed Reserve System considered biological goals and objectives and maximized conservation benefit with the minimum amount of land. The second iteration of the maps took into account relevant land use and broad financial considerations. For example, areas with larger parcel sizes were selected over areas with very small parcels, all else being equal, due to the higher per-acre cost of small parcels. Areas without extensive rural development were favored over areas with such development, all else being equal, due to the habitat incursions and edge effects around rural development. In cases where the conservation priorities overlapped with covered activities, alternative conservation sites were sought. If an alternative conservation site was not available, then the covered activity was scaled back or dropped to allow for the conservation to occur. For example, urban development has been limited along stream corridors to ensure adequate conservation of stream and riparian systems (see Chapter 6, Condition 11 *Stream and Riparian Setbacks*). This step-wise approach enabled the proposed Reserve System to be developed independently from the covered activities but in a manner that quickly identified and resolved conflicts between them.

The independent Science Advisors and stakeholders provided early feedback on draft reserve design and assembly principles and the preliminary reserve design process. Reserve design alternatives were reviewed by all of the major land management and conservation organizations in the study area: County Parks, Open Space Authority, State Parks, The Nature Conservancy, and the Peninsula Open Space Trust, as well as staff from the Wildlife Agencies. Their valuable input was incorporated into the conservation strategy presented here.

## Reserve Design and Assembly Principles

The reserve design process utilized scientifically accepted tenets of conservation biology in concert with the best available biological data (Noss et al. 1995). Information on species (e.g., population biology, genetics, distribution, life history characteristics) and information on habitats (e.g., distribution, composition, ecological functions) informed the reserve design process. Relevant ecological data for covered species are summarized in the species accounts in **Appendix D**.

To be successful, a reserve system must be designed in consideration of multiple ecologically relevant spatial levels. Most small- and medium-level considerations are driven by the needs of covered species and natural communities. For example, at a small level, a reserve system must contain the microhabitats necessary for local populations of the species to survive. At a medium level, habitat patches must be large enough to support populations or important portions of populations of species and the seasonal movement of species (e.g., aquatic habitat for winter breeding of amphibians and upland habitat for non-breeding periods). At a larger level, natural communities must be well represented, and reserves must be linked to allow movement of species for genetic exchange and for recolonization following local extirpation. Biological goals and objectives pertaining to the acquisition and management of the Reserve

System were developed at these three levels as discussed above (Section 5.2.1 *Biological Goals and Objectives*).

In addition to the biological goals and objectives, the principles of conservation biology summarized below (Soule and Wilcox 1980; Soule 1986; Primack 1993; Noss et al. 1997; Margules and Pressey 2000; Groom et al. 2006) were used as design criteria for the Reserve System. The reserve design and assembly principles must also be used to assemble the Reserve System during Plan implementation.

- **Maximize Size Efficiently.** The Reserve System will be as large as possible within funding and management limits. It must be large enough to mitigate impacts of covered activities and contribute to the recovery of covered species in the study area. A large reserve system is important to ensure viable populations or portions of populations of covered species, to maximize protection of species sensitive to disturbances from adjacent land use, and to maximize the protection of biodiversity. Large reserves tend to support more species for longer periods of time than small reserves. Large reserves are also generally easier to manage on a per-acre basis because, for example, a large reserve reduces conflicts that may arise when managing for covered species with very different habitat requirements. Large reserves also better allow for large-scale management treatments such as prescribed burning and livestock grazing and the maintenance of natural disturbance regimes such as flooding. The only way to maximize size within funding and other constraints is to protect areas efficiently.
- **Preserve Irreplaceable and Threatened Resources.** Irreplaceability is a measure of the degree to which conservation goals can be met by preservation of multiple sites. A site with high irreplaceability has unique species or natural communities that cannot be preserved or restored elsewhere. An example of an irreplaceable resource in the study area is serpentine grassland, which cannot be replaced elsewhere once lost. Threatened resources are those most under threat from natural or anthropogenic factors. The Reserve System will first protect biological diversity and natural communities that have a high level of irreplaceability and a high degree of threat.
- **Preserve the Highest-Quality Communities.** The Reserve System will preserve the highest-quality natural communities and habitat for covered species in the study area. *Highest quality* is defined using various parameters and differs according to community type, but highest-quality habitats are frequently characterized by a high abundance and diversity of native species, intact natural processes, and few roads or other evidence of human disturbances. Degraded communities may need to be preserved as well to capture unique habitats or populations of covered species, to link preserve areas together, or to provide opportunities for land cover restoration required by this Plan.
- **Preserve Connectivity.** The Reserve System will link existing protected areas and proposed reserves inside and outside the study area to maximize habitat connectivity. This will maintain and enhance the ability of organisms to move between reserves; facilitate exchange of genetic material, species

migration, dispersal, and colonization; and increase the integrity of the network of reserves (e.g., reducing the extent of reserve edge that is in contact with adjacent land uses). Linking reserves may require acquisition of disturbed habitats that can be restored to facilitate better habitat and wildlife movement value. A single large reserve is generally better than several small, linked reserves of equal area in the context of maintaining viable populations of species. In some cases, however, small or isolated reserves are necessary to protect certain features or populations with high biological importance (e.g., covered plant species populations, unique or especially diverse land cover types such as serpentine grassland or scrub). Preserving connectivity will also tend to minimize habitat fragmentation.

- **Minimize Edge.** The Reserve System will share a minimum amount of edge (i.e., will have the greatest possible area-to-perimeter ratio) with non-preserve land, especially urban development, to minimize the indirect effects of adjacent land uses on the preserve resources and to minimize management costs. For example, preserves will tend toward round or square configurations rather than long and narrow ones. In some cases, however, preserves with low area-to-perimeter ratios may be appropriate to protect linear features with high biological value, such as streams, riparian woodland, valley bottoms, or ridgelines essential to wildlife movement.
- **Buffer Urban Impacts.** When adjacent to existing urban areas or planned urban areas (i.e., areas zoned for urban development), the Reserve System will include buffer lands within its boundaries. The purpose of this buffer land is to reduce indirect effects on covered species and natural communities from urban development and to provide a zone for fuel load management to reduce the risk of wildland fire spreading to adjacent development<sup>5</sup>. The size of the buffer will depend on site-specific conditions such as topography, the intensity of adjacent urban development, the natural community being separated from the development, the condition of the buffer lands, and whether covered species are or will be present near these lands. (See the section on *Buffer Zones within the Reserve System* below and Chapter 6, Section 6.4.6, subheading *Condition 10 Fuel Buffer*.)
- **Fully Represent Environmental Gradients.** The Reserve System will include a range of contiguous environmental gradients (e.g., topography, elevation, soil types, geologic substrates, slopes, and aspects) to allow for shifting species distributions in response to catastrophic events (e.g., fire, prolonged drought) or anthropogenic change (e.g., global warming).
- **Consider Watersheds.** The Reserve System will include a full range of catchment types, including watersheds, subwatersheds, and headwater streams that are not already in protected status; this approach can help to maintain ecosystem function and aquatic habitat diversity.
- **Consider Full Ecological Diversity within Communities.** The Reserve System will reflect the full ecological diversity within natural communities (e.g., species composition, dominant species, physical and climatic factors) in order to maintain sufficient habitat diversity and species and population interactions. This principle is also called *representativeness* and

<sup>5</sup> Consistent with California Public Resources Code 4291.

*comprehensiveness*. Some of the diversity within each of the Habitat Plan land cover types is described in Chapter 3.

- **Consider Management Needs.** Reserves will be manageable. That is, desired management treatments such as livestock grazing, prescribed burning, or invasive species control must be feasible on the reserve units and within the Reserve System. In general, larger reserves are easier to manage on a per-acre basis, but other factors such as adjacent land uses, topography, and parcel configuration must also be considered. Management needs may be driven by factors on or off site (e.g., adjacent land uses, watershed processes such as upstream erosion or ongoing contamination).

## Requirements of Covered Species

The Reserve System is intended to preserve and in many cases enhance populations of covered species. The ecological information used to determine the needs of covered species is summarized in the species accounts (**Appendix D**) and in this chapter.

### All Covered Species

The principles listed below, which apply to all covered species, were used to design the Reserve System and will be used to assemble the Reserve System during implementation.

- **Protect Multiple Populations of Covered Species.** In order to maintain viable populations of covered species, multiple populations of covered species will need to be protected and linked through existing or new protected lands to reduce the risk of local extirpation and ensure the genetic connectivity of populations. This is especially important for species that may function as metapopulations<sup>6</sup> or for species that naturally occur at low density or small population sizes.
- **Protect Higher-Quality Habitat for Covered Species.** Habitat Plan reserves were designed to protect the highest-quality habitat for covered species and allow most impacts to occur in lower-quality habitat.
- **Protect Suitable but Unoccupied Habitat for Covered Species.** Protecting suitable but unoccupied habitat for covered species creates opportunities to enhance habitat through improved management, attracting species to new areas and expanding their ranges and population sizes. Protecting unoccupied habitat also allows for future shifts in populations in response to natural and anthropogenic environmental change.

Consistent with the reserve design approach described above, the needs of covered species were considered at the landscape and habitat levels, and then

<sup>6</sup> A *metapopulation* is a group of partially isolated populations belonging to the same species that are connected by pathways of immigration and emigration. Exchange of individuals occurs between such populations, enabling recolonization of sites from which the species has recently become extirpated (locally extinct).

independently at the species level to ensure that each species' biological goals and objectives would be met. The conservation strategy in this Plan applies a "multi-species umbrella" approach (Lambeck 1997), where the species selected as covered species are the ones in the study area most under threat (i.e., those already listed or most likely to become listed during the permit term).

## Bay Checkerspot Butterfly

Early in the development of this Plan, it was recognized that one covered species, Bay checkerspot butterfly, would greatly influence the design of the Reserve System, particularly for the serpentine grassland land cover type. Because the study area supports all of the known populations and individuals of this subspecies throughout its range, a relatively high conservation target was set to protect it so that this Plan could contribute substantially to its recovery (**Table 5-1c**). Many of the serpentine plant occurrences also coincide with habitat for Bay checkerspot butterfly. In this sense, Bay checkerspot butterfly serves as an umbrella species<sup>7</sup> for many serpentine plants. For these reasons, the reserve design process began by determining the preservation needs of Bay checkerspot butterfly.

The reserve design for this species was a major focus of discussion at the biological goals and objective workshop held for serpentine species. The reserve design for Bay checkerspot butterfly had the benefit of extensive previous research and recommendations for specific reserve design strategies (e.g., Thomas Reid Associates et al. 1985; Harrison et al. 1988; Murphy 1988; Weiss et al. 1988; Murphy et al. 1990; Hanski et al. 2004). In addition, the USFWS Recovery Plan and revised critical habitat designation recommend specific land acquisition actions that could result in delisting of the subspecies (U.S. Fish and Wildlife Service 1998c, 2008). Many of these recommended actions were incorporated into the conservation strategy.

## Existing Open Space in the Reserve System

An estimated 117,686 acres, or 26% of the study area, are protected as Type 1, 2, 3, or 4 open space. These areas are already owned by public agencies or private conservation organizations or are subject to private conservation easements (**Figure 2-3, Table 2-2, and Table 5-4**). Type 1 open space is protected in perpetuity for the specific purpose of managing and protecting ecological integrity. Type 2 lands are also managed for the preservation of ecological integrity, but are not protected in perpetuity. Although ecological protection is not the primary management goal, Type 3 open space lands still provide some level of ecological value and function. Type 4 open space lands are not managed for ecological integrity and they offer little or no long-term or measurable ecological value. (See Chapter 2, Section 2.2.5 *Protection and Resource*

<sup>7</sup> *Umbrella species* are species whose occupancy areas are large enough and whose habitat requirements are broad enough that, once protection is established, it will bring other species under that same protection (e.g., Lambeck 1997; Fleishman et al. 2000; Rubinoff 2001).

*Management Status of Open Space Lands* for more discussion and examples of open space types.)

The Reserve System was designed to take advantage of the substantial amount of open space land already conserved within the study area. Existing Type 2 or 3 open space in the study area that contributes to the biological goals and objectives of the Plan are proposed for inclusion in the Reserve System as *existing open space*. Enrolled existing open space must conduct their management and monitoring according to the requirements and guidelines outlined in this conservation strategy and in Chapter 7 *Adaptive Management and Monitoring Program*. In many cases, this new obligation represents a substantial improvement over the type and level of habitat and species management and monitoring practices that are currently in place. In other cases, this requirement will simply standardize management and monitoring to provide a cohesive Reserve System throughout the study area, and ensure consistent management and monitoring in perpetuity. This upgrade and standardization of management and monitoring on existing open space therefore constitutes an important part of this conservation strategy.

To determine which existing open space would be eligible for the Reserve System, the criteria listed below were applied to all existing Type 2 or 3 open space.

- The site contributes to the biological goals and objectives of this Plan and meets many of the reserve design principles described above.
- The site provides clear opportunities for habitat enhancement that would provide substantial benefits to one or more covered species.
- The site is owned by one of the Permittees and the management agency cannot afford to conduct biologically appropriate habitat management, enhancement, or long-term monitoring.
- Land uses on and surrounding the site are compatible with the management and monitoring required by the Plan (e.g., if the site is small, adjacent land uses will not preclude use of necessary management actions).

Existing Type 2 or 3 open space sites proposed for inclusion in the Reserve System are listed in **Table 5-5** and illustrated on **Figure 5-4**. This table also lists how these areas will be enhanced and how they will contribute to the biological goals and objectives of the Plan. **Table 5-5** lists six park units owned by County Parks. Up to 1,000 acres of lands owned by the Open Space Authority may also be included in the Reserve System. State Park lands were also considered for the Reserve System but were not included because that agency declined to participate in this Plan. The Implementing Entity, with review and approval by the Wildlife Agencies, may incorporate existing open space not included in **Table 5-5** or shown in **Figure 5-4** if it is determined that other lands are able to support the biological goals and objectives of the Plan.

For a site to qualify and receive credit as part of the Reserve System, the Implementing Entity will obtain a conservation easement or similar mechanism that is approved by the Wildlife Agencies over these lands. The conservation

easement (or similar mechanism) will ensure that these lands are managed and monitored in perpetuity as part of the Reserve System and in accordance with the terms of the Habitat Plan (see Chapter 8, Section 8.6.3 *Conservation Easements* for details).

## Conservation Gap Analysis

A key step in the development of a conservation strategy for a regional HCP or NCCP is to determine the existing level of protection for natural communities and covered species. Species or natural communities with low levels of existing protection may require greater emphasis in the Plan to ensure that their conservation in the study area is assured and the regulatory requirements of the NCCP Act are met. In contrast, species or natural communities that are well protected may need little or no additional protection by the Plan. For these species, the conservation strategy may instead focus on habitat restoration or improved habitat management. For all species it is expected that enhanced management and monitoring on existing and new protected lands will be needed.

The analysis conducted to determine the levels of existing protection of species and natural communities is called a *conservation gap analysis*. The methods used were based on similar approaches applied at the national, state, and local levels (Scott et al. 1993, 2001; Wild 2002).

The gap analysis was used as a preliminary step in the conservation planning process to guide the reserve design process. Conservation biology theory holds that by protecting a wide variety of ecosystems and natural communities or land cover types at a broad level (i.e., a coarse-filter and meso-filter approach; see **Figure 5-3**), the majority of the biological diversity contained within these natural communities will also be protected (Noss 1987; Hunter 2005). This approach is then complemented by focusing on finer-level resources such as species occurrences, species habitat, or unique physical features to conserve biological diversity not protected by the broader-level approaches.

## Conservation Gaps in the Study Area

To determine the gaps in protection in the study area, the following GIS data layers were overlaid with the open space Types 1, 2, and 3 layer (**Figure 2-3**).

- Land cover (see Chapter 3 and **Figure 3-10**).
- Species habitat distribution (see Chapter 3 for a general description of these models and **Appendix D** for the model parameters for each species).
- Watersheds (see **Figure 3-6**).

The results of the conservation gap analyses are presented in **Table 5-4** for land cover types and **Table 5-6** for covered species. Data are presented by open space Types 1, 2, 3, and 4 (see Chapter 2 for a definition of open space types). Because of the importance of protecting substantial portions of occupied and suitable



habitat for Bay checkerspot butterfly, **Table 5-7** presents the gap analysis for the individual populations recognized in the species account (**Appendix D**). Together, these results constituted a key input to the conservation strategy and the design of the Reserve System.

### Gaps in Land Cover and Watershed Protection

Many natural land cover types have greater than 30% of their extent in open space Types 1, 2 or 3 (**Table 5-4**). Natural land cover types that are generally well represented in the study area in open space (>40%) are mixed oak woodland and forest, ponderosa pine woodland, coastal and valley freshwater marsh, willow riparian forest and scrub, blue oak woodland, seasonal wetland, reservoir, and central California sycamore alluvial woodland. Natural land cover types with the lowest proportion in open space overall and where the conservation gaps are most likely to occur are knobcone pine woodland, coast live oak forest and woodland, rock outcrop, serpentine rock outcrop, northern mixed chaparral/chamise chaparral, mixed riparian forest and woodland, and California annual grassland. Agricultural land cover types are poorly represented in open space in the study area.

Of the five major watersheds in the study area (Coyote, Pacheco, Llagas, Guadalupe, and Uvas), Type 1, 2, 3, or 4 open space is greatest in quantity and proportion in the Pacheco and Uvas watersheds (34 and 20%, respectively). The Alameda and Guadalupe watersheds have the least representation in open space Types 1, 2, 3, or 4 (1% each), followed by the Uvas and Llagas watersheds (15% each). In all five watersheds, the majority of land in open space is upstream of reservoirs. There is no Type 1, 2, 3, or 4 open space in the portion of the Santa Cruz Mountains watershed—which includes the headwaters of Pescadero Creek—within the study area (7,209 acres).

Of the 2,392 miles of mapped USGS blue line streams within the study area, approximately 34% are within Type 1, 2, or 3 open space. The Plan will also provide additional protection for ephemeral streams that are not mapped. The level of protection for these streams is generally high with approximately 16% in irrevocable protection and 34% of streams in Types 1, 2, or 3 open space.

### Gaps in Species Protection

As shown in **Table 5-6**, most covered species with models have moderate levels of representation in open space Types 1, 2, and 3, between 25% and 50%. Exceptions to this are San Joaquin kit fox secondary habitat and secondary habitat (low use); western burrowing owl overwintering, occupied nesting, and potential nesting habitat; tricolored blackbird secondary habitat; least Bell's vireo primary habitat; Loma Prieta hoita secondary habitat, and most beautiful jewelflower secondary habitat. Potential breeding habitat for least Bell's vireo is particularly underrepresented in Type 1, 2, or 3 open space (11%). No species' habitat occurs in open space Types 1, 2, and 3 above 50%.

**Table 5-7** presents more detail on the status of protection for all Bay checkerspot butterfly populations in the study area, because this species is one of the key species used to design the conservation strategy. As described in the biological goals and objectives for this species (**Table 5-1c**), some populations are targeted

for conservation. Of these targeted populations, more than two-thirds are in need of long-term protection, and the level of occurrence in open space by population varies from zero to 100%.

## Regional and State Gaps

Gap analyses conducted at scales larger than the study area were also considered to determine whether land cover types in the study area are underrepresented in Type 1, 2, or 3 open space compared to other regions or to regional conservation targets. For example, the conservation strategy in this Plan will contribute to regional conservation goals for land cover types found throughout the region.

Analysis at the regional scale entailed consulting a gap analysis conducted in the nine-county San Francisco Bay Area (Wild 2002). Although that study was conducted using an older and much coarser dataset<sup>8</sup>, it provided a wider regional context and helped to inform conservation priorities for the Habitat Plan. This study utilized a system of open space classification (based on Davis et al. 1998) similar to the one used in this Plan. **Table 5-8** lists the vegetative communities that are found in the study area (equivalent to Habitat Plan land cover types) that were identified as being underrepresented in protected status in the San Francisco Bay Area. Data are also presented in **Table 5-8** on the level of protection of these vegetation communities at the state level (Davis et al. 1998).

## Landscape Linkages

Landscape linkages were also used to design the Reserve System. For the purposes of this Plan, landscape linkages are defined as areas that allow for the movement of species from one area of suitable habitat to another. A linkage can vary from a narrow strip of habitat that only functions as a conduit for movement (i.e., a corridor) or a large area of intact habitat that is used for movement, dispersal, and other life functions such as foraging and breeding.

The NCCP Act explicitly requires NCCPs to address landscape or habitat linkages, as shown below.

Establishing one or more reserves or other measures that provide equivalent conservation of covered species within the plan area and linkages between them and adjacent habitat areas outside of the plan area.  
(Section 2820[a][4][B].)

Sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the plan area. (Section 2820[a][4][E].)

<sup>8</sup> This analysis utilized land cover data from the California Gap Analysis Project (Davis et al. 1998), which used aerial photography from 1990 and minimum mapping units of 247 acres (100 hectares) for upland communities and 98.8 acres (40 hectares) for wetland communities. In addition, the open space data are from 2002.

Some species require linkages for periodic migrations among different habitat types used for breeding, feeding, or roosting. Wildlife movement from one important habitat area to another may vary from daily to seasonal migration depending on the species. Linkages may also be needed for the permanent immigration or emigration of individuals among habitat patches, allowing for gene flow and recolonization after local extinction (Beier and Noss 2000; Hilty et al. 2006; Groom et al. 2006).

Linkage requirements differ greatly from species to species. Specific characteristics of linkages, such as dimensions, location, and quality of habitat, can influence species use. Wider linkages tend to be more effective than narrower linkages (Merenlender and Crawford 1998; Hilty et al. 2006).

To incorporate landscape linkages in the reserve design process, all known or potential linkages within the study area and in the surrounding areas were compiled from the following sources, in no particular order.

- Statewide assessment of wildlife linkages needs developed by expert opinions of wildlife biologists (California Wilderness Coalition 2002).
- Ecoregional planning process conducted for the central coast region (The Nature Conservancy 2006b).
- A study of movement needs of mountain lions estimated by least-cost path analysis of regional land cover data (Thorne et al. 2002).
- A local workshop on wildlife linkages in the Sierra Azul region<sup>9</sup> held on October 11, 2006 (Coastal Training Program, Elkhorn Slough National Estuarine Research Reserve 2006).
- Wildlife movement data from the study area for American badgers (Diamond 2006; T. Diamond pers. comm.), Tule elk (Coletto 2006; H. Coletto pers. comm.), bobcat, and other species (T. Diamond pers. comm.).
- Locations of existing culverts, bridges, and other overpasses suitable for wildlife along U.S. 101 between Metcalf Road in San José and the Coyote Creek bridge crossing near Morgan Hill (California Department of Fish and Game 2006).
- Locations of median barriers and existing culverts, bridges, and other overpasses suitable for wildlife along SR 152 between the SR 156 interchange and the Santa Clara/Merced County line (data collected by Jones & Stokes in February 2007).
- *Coyote Valley Specific Plan Draft Environmental Impact Report* (City of San José 2007).

Potential dispersal routes for plants and wildlife covered by the Plan were also inferred from the land cover data, compiled occurrence data, and habitat distribution models developed for this Plan (see Chapter 3 and **Appendix D**).

<sup>9</sup> The Sierra Azul region was defined to encompass the southern portion of the Santa Cruz Mountains south of Highway 17, the Diablo Range, and the Gabilan Range. The workshop focused on issues of connectivity between the Santa Cruz Mountains and the Diablo and Santa Lucia mountain ranges to the east and south.

The results of the compilation of these sources are described in **Table 5-9** as 20 distinct and potential landscape linkages found either entirely within the study area or within the study area that lead to outside the study area. **Figure 5-6** illustrates these 20 potential linkages, which are discussed below for their relative importance to the Habitat Plan. These linkages are drawn at a regional level as broad swaths of natural land cover types rather than specific alignments or corridors. Often there are multiple ways to protect land to achieve the linkage design in **Figure 5-6** and the goals in **Table 5-9**.

## Regional Connectivity

Maintaining linkages with areas outside the study area (i.e., regional habitat connectivity) is essential to retaining a high level of native biological diversity within the study area. For example, the southeast part of the study area may be an important linkage within the Diablo Range to the north and south (Linkage 15). The San Luis Reservoir in Merced County forms a significant barrier to terrestrial wildlife moving through the eastern Diablo Range, and the study area includes most of the Diablo Range west of the reservoir. Habitat continuity in this area likely benefits species such as San Joaquin kit fox. If kit foxes move from the Salinas Valley to the San Luis Reservoir area in Merced and Stanislaus Counties, they may use the southeastern part of the study area as a secondary route around the San Luis Reservoir.

The Santa Cruz Mountains on the western edge of the study area provide a connection for wide-ranging species between the Santa Cruz Mountains in Santa Cruz and San Mateo Counties and the Gabilan Range to the south. This connection is most apparent at the southern tip of the study area (Linkages 19 and 20) where there is a narrow linkage through the “Chittenden Gap” in Santa Cruz County to the Gabilan Range and the Santa Lucia Range to the south. If linkages like this are severed, populations of wide-ranging species (e.g., mountain lion) could be extirpated from the Santa Cruz Mountains because that range is likely insufficient in size to sustain a viable mountain lion population on its own (Thorne et al. 2002; Coastal Training Program 2006).

## Connectivity within the Study Area

Within the study area, many landscape linkages are important to maintain connections among populations. For example, the major stream corridors of Coyote Creek, Guadalupe River, Pacheco Creek, Uvas Creek, Llagas Creek, Pajaro River (Linkages 1, 2, 11, 12, 17, 18), and Pescadero Creek all support native fish species. These corridors also provide critical connections for other aquatic and terrestrial species moving through urban or cultivated agricultural areas.

There is considerable existing open space in the Santa Cruz Mountains both inside and outside the study area (**Figure 2-3**). Additional linkages could be made between existing open space within the study area (Linkages 9 and 13).

Such connectivity would benefit covered species such as California tiger salamander, California red-legged frog, and foothill yellow-legged frog, and other native species such as Coast Range newt, bobcat, and mountain lion.

Protected areas adjacent to Henry W. Coe State Park form a large nucleus of open space within the study area. These protected areas already provide landscape linkages for species such as California red-legged frog, California tiger salamander, Tule elk, American badger, bobcat, mountain lion, and mule deer. Additional landscape linkages would connect this large core open space with smaller protected areas and with key features outside the study area (e.g., Linkages 5, 6, 7, 14, 15, and 16).

## Linking the Santa Cruz Mountains and the Diablo Range

Historically, the Santa Cruz Mountains and the Diablo Range were linked across the Santa Clara Valley through a network of creeks, wetland complexes, and large stands of valley oak woodland (San Francisco Estuary Institute 2006). Over time this linkage has diminished with urban development, road barriers, and cultivated agriculture. Because some of the valley floor has remained in agricultural production and the creek corridors are largely intact, some connectivity remains (Linkages 8 and 10). There has been considerable debate recently about the best means to maintain this important connectivity between the Santa Cruz Mountains and the Diablo Range within the study area (Coastal Training Program 2006; City of San José 2007).

The connectivity between the Santa Cruz Mountains and the Diablo Range is expected to degrade further as covered activities are implemented. For example, development within Morgan Hill and Gilroy will make it more difficult for some wildlife species to cross the valley floor. While the Habitat Plan does not authorize incidental take associated with urban development in the Coyote Valley Urban Reserve at the southern end of San José, continued rural growth is expected to contribute to some long-term degradation (see Chapter 4). An important conservation objective of this Plan is to preserve and enhance the linkage between the two ranges (see Goal 2 in **Table 5-1a**). See landscape-level conservation actions in Section 5.3.2 *Landscape Conservation and Management* for more details.

## The Use of Maps to Define the Reserve System

Regional conservation plans take a variety of approaches in the use of maps to display land acquisition requirements. At one end of the spectrum, a conservation plan may use maps to delineate exactly where reserves are to be created. In this type of plan, often called a *map-based plan*, map designations define the application of regulations, fees, land acquisition, restoration, or other elements of the plan. Because all landowners must agree to the designation placed on their lands, purely map-based plans (otherwise known as *hard boundary* or *hard line* plans) are difficult to develop on a large scale and are rare.

At the other end of the spectrum, a conservation plan may display no maps or only very general maps and instead include a *process-based* land acquisition strategy. A purely process-based plan (also known as a *policy-based* or *criteria-based* plan) has no maps of where reserves will be established or other mitigation accomplished. Instead, the conservation plan outlines a detailed process by which reserves are assembled according to a set of clear criteria. The amount of flexibility in a process-based plan depends on the flexibility of the reserve assembly criteria.

The Local Partners considered the full range of available approaches and chose to employ a combination of these strategies. This Plan uses a hybrid approach in which maps display conservation priorities on a regional scale. Land acquisition will be undertaken in accordance with a detailed set of requirements, while maintaining flexibility in how the Reserve System is ultimately assembled. Although the final boundaries of the system cannot be known, the general location, size, configuration, and protected resources of the reserves are described in the conservation actions below. The Local Partners considered this element of the Plan to be essential to its success.

## Geographic Units of Conservation

The study area was subdivided into 34 discrete units called *conservation analysis zones* (**Figure 5-5**) to identify locations for conservation actions consistent with the hybrid approach to the use of maps described above. These zones define the areas in which conservation actions could occur outside existing protected areas. The primary purpose of these zones is to describe the specific areas in which conservation actions such as land acquisition will occur without identifying individual parcels. This focuses the conservation actions in a spatially explicit manner while maintaining the flexibility to conduct these actions on different parcels to meet the same conservation objectives (i.e., to respond to willing sellers where they arise). The arrangement of the zones also provides a mechanism to apply conservation actions at several spatial scales using consistent units (e.g., within a watershed, within a combination of zones, or within a single zone).

The conservation analysis zones were developed using subwatershed boundaries from the California Department of Water Resources (Calwater 221) that were aligned with the watershed boundaries used by the Habitat Plan. Existing open space (Types 1–3) was excluded from the zones. Subwatersheds smaller than 3,000 acres were merged with their adjacent larger subwatershed within the same watershed. Other adjustments were made to the zone boundaries to facilitate the conservation strategy; for example, the large Santa Clara Valley subwatershed that includes lower Llagas Creek was split into two subwatersheds for planning purposes<sup>10</sup>. Subwatersheds with mostly urbanized areas were also merged for convenience.

<sup>10</sup> In addition, the subwatershed surrounding Anderson Reservoir was merged with the adjacent three subwatersheds to create a less fragmented conservation planning unit.

Conservation analysis zones were defined within the six primary watersheds of the study area: Guadalupe, Coyote, Llagas, Uvas, Pacheco, and Pescadero (**Figure 5-5**). The portions of the study area within the Calabazas and San Tomas watersheds were combined into a single conservation analysis zone. Conservation analysis zones were numbered sequentially within each watershed generally from headwaters to their exit from the study area. The size and land cover types found in each conservation analysis watershed is shown in **Table 5-10**.

## Reserve Assembly Process

The Implementing Entity will establish the Reserve System through acquisition of land in fee title, conservation easement, or purchase of credits at an approved mitigation bank. Lands will only be acquired from willing sellers or donors and lands must meet one or more of the biological goals and objectives and the land acquisition requirements described below. The Implementing Entity will assemble the Reserve System in any of the following ways.

- Inclusion of land owned by a Permittee by conservation easement.
- Purchase of land in fee title from willing sellers.
- Purchase of conservation easements from willing sellers.
- Purchase of land or conservation easements in partnership with other organization(s) (not to be used as mitigation for another project that is not a covered activity).
- Acceptance of land or easement dedication in lieu of some development fees if the easement contributes to the goals and objectives of the Habitat Plan and is approved by the Implementing Entity and the Wildlife Agencies.
- Acceptance of credits sold in private mitigation banks approved by USFWS and CDFG if they meet the terms of the Plan (see Chapter 8, Section 8.6.2 *Land Acquired by Other Organizations or through Partnerships*, subheading, *Private Mitigation Banks*).
- Acceptance of land or easement dedication as a gift or charitable donation.

Acquisition of land in fee title or use of conservation easements will likely be the primary mechanisms used in most conservation analysis zones. Conservation easements will be used when the property owner wishes to enter that type of arrangement rather than sell land in fee title. The terms of each conservation easement may be tailored to each landowner and parcel, but will be consistent with goals of the conservation strategy, the general principles for easements outlined in this Plan (see Chapter 8), and the guidelines in the Implementing Agreement. The land and conservation easement acquisition process and the conditions under which the other four reserve assembly techniques may be used are discussed in detail in Chapter 8.

To achieve the Plan's biological goals and objectives, including contribution to the recovery of covered species, it is important to focus land acquisition where it

will have the greatest conservation benefit. By concentrating land acquisition in certain areas, larger effective reserves can be assembled by augmenting and connecting existing protected lands. However, the Implementing Entity must have flexibility in deciding where to acquire land because the Plan depends on the availability of willing sellers. The Plan balances these needs by focusing acquisition of certain land cover types within certain conservation analysis zones, as described below.

Despite this flexibility, the Implementing Entity will prioritize land acquisition in order to buy parcels of greatest conservation value (e.g., see *Reserve Design and Assembly Principles*, above) under the greatest threat of development and whose cost is expected to rise fastest. These criteria are met in conservation areas that span the floor of the Santa Clara Valley (Coyote-7, Llagas-3, Llagas-4) and the foothills immediately adjacent to the valley floor (Guadalupe 1, 3; Coyote-7, 8; Llagas-2, 3, 4; Uvas-1, 2, 5, 6; Pescadero-1).

When possible, land will first be acquired adjacent to existing protected areas to ensure that, in the unlikely event that funding does not become available for full acquisition of the Reserve System (see Chapter 9 for details), the Reserve System is composed of contiguous units rather than isolated parcels.

## Field Verification Prior to Acquisition

Land cover data, species occurrence data, and species habitat distribution models were developed for this Plan at a regional scale. The data and models were used to develop a sound conservation strategy for the study area at this regional scale. These data and models are not intended for site-specific planning because of the limitations described in Chapter 3.

To account for some of the uncertainty inherent in this conservation strategy, biological resources in potential conservation areas will, whenever possible, be verified in the field prior to land acquisition. The Implementing Entity will conduct *pre-acquisition assessments* on potential reserve lands to evaluate whether these lands are likely to meet Plan requirements. If a pre-acquisition assessment is not feasible, the Implementing Entity will conduct an assessment of the site based on air photo analysis and the best available regional data sets (e.g., Habitat Plan data, CNDDB).

The biological suitability of the site for the Reserve System will be determined on the basis of the information listed below.

- The results of past biological surveys, updated land cover mapping, assessments of habitat suitability for covered species, air photo interpretation, and the biological resources present or expected on site.
- An evaluation of the site's enhancement and restoration potential.
- An evaluation of how well the site achieves the reserve design principles listed above.



- An evaluation of the site's existing and potential biological value in the context of the remaining unmet biological goals and objectives and land acquisition requirements.

Types of information collected during these assessments will include an evaluation of location, quantity, quality, and type of covered species populations; covered species habitat; and natural communities present, as well as other site conditions or infrastructure that would benefit or conflict with the Plan's biological goals and objectives. The site's restoration and enhancement potential will also be evaluated. This information will help the Implementing Entity prioritize acquisition of reserve lands based on their relative contribution toward meeting the biological goals and objectives. More details on pre-acquisition assessments are found in Chapter 8.

## 5.2.4 Aquatic Habitat Protection and Enhancement

Protection and enhancement of aquatic habitat for covered species and other native species is an important goal of this Plan. Protection of off-stream aquatic habitats will be accomplished through the land acquisition process described below and through the stream and riparian setback requirement described in Chapter 6 (see Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks*). In addition, the Plan requires restoration of aquatic land cover types to ensure no net loss in their extent and function within the study area.

The approach to stream and riparian woodland land cover protection and enhancement combines elements of land acquisition, restoration, and water management. The land acquisition strategy focuses on stream protection primarily in areas where large stands of riparian woodland are present, such as along Pacheco Creek, San Felipe Creek, and upper Uvas Creek. This focus has the dual benefit of protecting streams and riparian woodland habitats. Stream protection through land acquisition will also occur in areas most suitable for riparian woodland restoration to support covered birds, amphibians, reptiles, and native fish species.

Stream and riparian protection will also occur through the development review process when projects are proposed adjacent to streams. Through the stream and riparian setbacks condition (Condition 11 described in Chapter 6), applicants will be required to set aside stream frontage to protect stream and riparian functions. In some cases, high-value stream setback areas will be incorporated into the Reserve System to increase opportunities for riparian and stream restoration, and provide greater consistency in management and monitoring of these areas.

To enhance habitat for native fish species and covered amphibian and riparian bird species, broader strategies are needed than riparian woodland restoration in specific locations. To contribute to the recovery of covered amphibians and reptiles, the Plan will acquire and enhance upper watershed streams and associated upland riparian habitat throughout the study area. To enhance habitat

for least Bell's vireo and other native songbirds, the Plan will provide riparian restoration opportunities along Llagas Creek, Pacheco Creek, Uvas Creek, and the Pajaro River.

## 5.2.5 Land Management

The primary means of mitigating impacts on and conserving covered species and natural communities is preservation of high-quality habitat in accordance with the reserve design criteria outlined above. In order to meet regulatory requirements and to contribute to the recovery of covered species, habitat enhancement, restoration, and creation are also important components of the conservation strategy. Some land cover types that are lost to covered activities will be replaced with the same or similar communities or land cover types within the Habitat Plan reserves. Habitat enhancement, restoration, and creation ensure that there will be no net loss of certain resources (e.g., wetlands, breeding habitat for specific covered species). In other cases, restoration and enhancement are used to supplement preservation to adequately conserve land cover types or covered species habitat.

Some habitat-restoration requirements exceed those typically required for individual mitigation in order to contribute to the recovery or prevent listing of covered species that these habitats support. (These greater restoration requirements are also proportional to the stronger regulatory assurances provided by CDFG to the Permittees and private developers within the participating jurisdictions.) Depending on the resource, creation, restoration, or enhancement is required as part of the conservation strategy. Habitat enhancement, restoration, and creation will occur in addition to, not as a substitute for, land preservation. Success criteria for habitat enhancement, restoration, and creation will be based in part on reference stands in the region. Reference stands will be selected based on their condition as representative of high-quality communities in the study area. Such use of reference stands will allow habitat enhancement, restoration, and creation plans to incorporate any unique regional characteristics of these habitats. Each of these terms is defined below.

## Definitions

**Appendix A Glossary** has a complete list of definitions used in this Plan. The following are selected key definitions critical to the conservation strategy.

### Habitat Enhancement

*Habitat enhancement* is the manipulation of the physical, chemical, or biological characteristics of a land cover type to heighten, intensify, or improve one or more specific existing ecological function(s). Enhancement results in the gain of selected existing ecological function(s), but may also lead to a decline in other ecological function(s). Habitat enhancement implemented in the Reserve System will result in an increase or improvement in specific ecological function without

a change in the amount of land cover types. Examples of ecological functions include native species richness, species diversity, native vegetative cover, and wildlife habitat.

Examples of habitat enhancement include:

- Planting valley oak seedlings in an existing stand of valley oaks to increase oak cover and density and improve the age-class structure of the valley oak population.
- Manipulating the growth stage composition of vegetation on a site.
- The reduction or removal of one or more threats to covered species or natural communities, including:
  - The treatment and removal of invasive species including bullfrog removal, weed abatement, and prescribed burning (see **Appendix D** for a discussion of threats to each covered species).
  - Permanently protecting Reserve System lands to remove threats of development, overcollecting, overgrazing, lack of grazing, and others.
  - Fencing installation and repair to support improved livestock grazing and prevent unauthorized access.
  - Reducing hazards to animal movement by adding or resizing culverts or reducing traffic on private roads within the Reserve System.

Enhancement actions will differ according to each natural community and site. For example, some communities in the study area have inherently low productivity, low species richness, or low vegetation cover. Enhancement of these communities may be measured by an increase in relative cover of native plants or a decrease in inappropriate disturbance.

The appropriate type of habitat enhancement will be considered on a site-by-site basis by the Implementing Entity within the context of the entire Reserve System and Plan goals and objectives. Habitat enhancement will occur on all lands preserved in the Reserve System. The level of habitat enhancement will vary greatly within the Reserve System. For example, degraded communities will need a higher degree of enhancement than lands with little or no degradation. Some natural communities will need little to no management unless changed circumstances occur; in these cases, permanent protection of the land and the removal of key threats may be the only enhancement occurring on those sites.

Habitat enhancement will be informed by pre-acquisition assessments, targeted studies and by the monitoring and adaptive management program, to conserve the populations of all covered species and maintain or improve ecological processes.

## Habitat Restoration

*Habitat restoration* is the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a site that historically supported such functions, but no longer does because of the loss of one or more required ecological factors or as a result of past disturbance.

Restoration typically involves altering the soil or other substrate to improve a site's ability to support the historic land cover types, although it may also include physical manipulation to restore specific ecological function in a site where that function has been lost (e.g., removal of hardscape in a stream channel and re-vegetation with riparian plantings). In contrast to enhancement, restoration results in the re-establishment of ecological function, value, and acreage of a natural community or land cover types.

For example, riparian woodland could be restored to stream reaches that historically supported them. In this Plan, habitat restoration is only allowed in those land cover types for which techniques are generally successful, and where restoration would substantially enhance habitat for covered species and native biological diversity. Restoration actions must also incorporate the best available science.

Habitat restoration may not restore all functions of natural communities. For example, recent studies of wetland restoration projects indicate that many of them fail to meet success criteria or lack important functions of natural reference sites (National Research Council 2001). The conservation strategy takes this uncertainty into account by relying primarily on habitat preservation and by requiring habitat restoration in amounts exceeding typical mitigation ratios. Also, uncertainty is taken into account by the adaptive management strategy (see Chapter 7 *Monitoring and Adaptive Management Program*).

Habitat restoration will be focused in the Reserve System, including existing open space that may become part of the Reserve System. Riparian and stream restoration that is counted towards the total conservation benefit of the Plan (**Table 5-13**) is allowed on private or public lands outside the Reserve System (i.e., without a conservation easement) as long as the following conditions are met.

- Restoration is conducted by a Permittee, including the Implementing Entity, or a third party under contract with a Permittee.
- Restoration is done consistent with the *Reserve Design and Assembly Principles* described in Section 5.2.3<sup>11</sup>.
- The site is restored to pre-project or ecologically improved conditions within 5 years of the end of the covered activity.
- A Wildlife Agency-approved site restoration plan is developed consistent with the requirements in Section 5.3.6 *Riverine and Riparian Forest and*

<sup>11</sup> Restoration efforts need to remain in compliance with the Plan's Stay-Ahead provision, described in Section 8.6.1.

*Scrub Conservation and Management*, subheading *Riparian Restoration*, subheading *Site Restoration Plan*.

- There are no suitable and feasible restoration sites within the Reserve System.
- The restoration project meets the riverine and riparian and requirements described below in Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*.
- The site is maintained in perpetuity according to the terms of the Plan by the Implementing Entity or a Permittee. If the site is maintained by a third party, the third party must enter into a contract with the Implementing Entity to ensure management according to the terms of the Plan.
- The Implementing Entity, or its designated third party, monitors the restoration site in accordance with Chapter 7.
- The Implementing Entity and Wildlife Agencies approve the project.

One exception to the requirement that the site be maintained in perpetuity is that restoration projects occurring on streams managed for flood control and human safety purposes may be adversely modified (i.e., modified such that the restoration no longer serves the functions for which it was designed) by future covered activities. In such cases, any adverse modification of a restoration site will be off-set by new restoration in an alternative location(s). New restoration actions must be initiated in advance of the new covered activity that would adversely modify the restoration site. All such arrangements will be discussed and approved by the Wildlife Agencies as soon as the Permittees or Implementing Entity become aware of such a need.

All restoration conducted outside of the Reserve System will be tracked by the Implementing Entity to ensure that the site is monitored and managed consistent with the requirements of the Plan for the Reserve System. These projects will also be identified in the annual report.

Stream and riparian restoration outside of the Reserve System (i.e., on lands not under a conservation easement) is likely to constitute a small proportion of the Plan's commitment to riparian and stream restoration (**Table 5-13**) because the Implementing Entity will prioritize all feasible sites within the Reserve System. In addition, restoration must comply with the Plan's reserve design and assembly principles which include, but are not limited to, preservation of the highest-quality communities, preservation of connectivity, and consideration of management needs. Furthermore, the Wildlife Agencies will also need to approve restoration outside of the Reserve System.

## Habitat Creation

*Habitat creation* is the manipulation of the physical, chemical, or biological characteristics present to develop a land cover type in an area that did not previously support it. Similar to restoration, creation results in establishment of

new ecological function, value, and acreage of a natural community or land cover types.

The only habitat creation proposed under this Plan is for ponds. Ponds will be created as breeding habitat for California red-legged frog or California tiger salamander in areas along streams that did not previously support ponds. This type of habitat creation must be balanced by the need to maintain and enhance stream functions. No on-stream ponds will be constructed in drainages that support, or could support, covered species under this Plan. Habitat creation will occur in damaged or disturbed areas to minimize the loss of existing habitats by the creation of new ones. Ponds may also be created in other appropriate areas as long as there is normally enough water, or a water source may be established (e.g., installation of a spring box or a well) to adequately maintain the necessary inundation schedule for the target species.

In-kind/like-function habitat creation is the establishment of the same land cover type as the land cover type lost to the covered activity, and that would establish the same type of ecological functions over time. For example, creating an artificial pond with species similar to those found in a natural pond would be in-kind/like-function creation.

Out-of-kind/like-function creation of habitat is the establishment of a different land cover type with some of the same ecological functions as the affected land cover type. Out-of-kind/like-function creation or restoration is not allowed under the Habitat Plan except in situations where historic physical conditions can be restored to recreate a community that has been lost historically. For example, sycamore alluvial woodland and alkali wetland may have been more common in the study area before human alterations of the landscape (San Francisco Estuary Institute 2006, 2008). If conditions supporting these communities could be restored, then the historic communities could be recreated out-of-kind.

## Land Management on Reserves

Reserve management is designed to maintain and enhance natural communities, habitat for covered and other native species, native biological diversity, and ecosystem function. The location of reserves and condition of resources within these reserves will not be known until suitable sites are identified, surveyed, and acquired. Therefore, site-specific management objectives and techniques cannot be developed until reserve sites are known. The Implementing Entity will prepare a *reserve unit management plan*.

Reserve unit management plans will be developed for each reserve unit to identify, on the basis of site-specific conditions and reserve objectives, the management and maintenance actions necessary to ensure that desired ecosystem characteristics and functions are maintained and enhanced. Reserve units are defined as groups of contiguous or neighboring parcels that have similar natural communities, covered species, and infrastructure. Reserve unit management plans must address and minimize the conflicts that may arise when managing for multiple species and habitats. Reserve unit management plans will also describe

reserve-specific actions to address invasive species, fire management, infrastructure maintenance, recreation, monitoring, agricultural activities, and mosquito abatement as applicable.

Separate reserve unit management plans will be prepared for a minimum of five reserve units. These reserve units are expected to support similar land cover types, covered species, and habitats, and will therefore face similar management issues. A list of likely reserve units is presented below based on the expected geographic distribution of the Reserve System.

- Upper Penitencia Creek,
- Coyote Ridge,
- Pacheco Watershed,
- Southern Santa Cruz Mountains, and
- Santa Teresa Hills.

The Implementing Entity may decide to prepare additional reserve unit management plans to address more specific geographic areas of the Reserve System.

All reserve unit management plans must be prepared in collaboration with the Wildlife Agencies and approved by the Implementing Entity and the Wildlife Agencies. In cases where reserve unit management plans include land that remain in private ownership (i.e., conservation easements but not fee title), plans will also be prepared in collaboration with applicable landowners. The Wildlife Agencies will review each draft reserve unit management plan and provide comments to the Implementing Entity within 60 days after receiving the draft plan. The Implementing Entity will revise the draft plan based on the Wildlife Agencies' comments, if any, and will provide a revised draft to the Wildlife Agencies, which will have an additional 60-day review period. If an initial draft reserve unit management plan or any subsequent revised draft reserve unit management plan adequately addresses a Wildlife Agency's comments, the Wildlife Agency will so notify the Implementing Entity within 60 days, and the reserve unit management plan will be deemed to be approved by that Wildlife Agency for purposes of this Plan, the Implementing Agreement, and the permits. In addition, if a Wildlife Agency does not provide comments within 60 days after receiving the revised draft reserve unit management plan, the Wildlife Agency will thereafter be deemed to have approved the revised draft plan for purposes of this Plan, the Implementing Agreement, and the permits. The Implementing Entity will incorporate comments submitted by the Wildlife Agency after the 60-day period in the revised draft reserve unit management plan to the extent that the Implementing Entity determines the comments can be incorporated.

Comments from the Wildlife Agencies will focus on implementation of the management techniques described in this chapter or introduction of new techniques associated with the adaptive management program and in response to monitoring results (see Chapter 7). The deadlines described above are established to ensure the timely review and comment on the reserve unit

management plans by Wildlife Agency staff and to enable the Implementing Entity to implement conservation actions as soon as possible.

Reserve unit management plans will also be updated and revised as part of the adaptive management program (Chapter 7). Land management on new reserves must not wait until adoption of the first reserve unit management plan; until the first reserve unit management plan is approved, land management will occur according to the guidelines in this chapter and best scientific practices. The conservation actions below describe the objectives, principles, and general requirements of these reserve unit management plans.

## Reserve Unit Management Plans

Reserve unit management plans will be prepared by the Implementing Entity for each reserve unit for natural land cover types (i.e., on land not cultivated or irrigated for crops or pasture; see the next section for management of other lands). Reserve unit management plans will describe reserve-specific management strategies for maintaining, and when necessary, improving existing habitat conditions for covered species. These plans will also facilitate the management of enhanced/created/restored habitats, to maintain or improve their functions over time through the adaptive management process. The Implementing Entity should consider developing decision trees or flow charts for certain types of management such as prescribed burning or invasive species management (e.g., Starfield and Bleloch 1991).

Reserve unit management plans will be prepared as soon as reasonably possible but not longer than 5 years following acquisition of the first parcel in a reserve unit or of placing a conservation easement on the parcel. This time period will provide an opportunity to conduct thorough inventories of the site's resources over several seasons. It will also provide the time necessary to seek review and approval from the Wildlife Agencies. Reserve unit management plans will be developed in partnership with adjacent land management agencies, resource agencies, and current grazing lessees, if any. In cases where reserve unit management plans include land that remain in private ownership (i.e., conservation easements but not fee title), plans will also be prepared in collaboration with applicable landowners. Input from interested citizens will be included in reserve unit management plan development through public outreach and education (see *Public Education and Outreach* below). When possible, new or updates to existing reserve unit management plans will be coordinated with concurrent open space planning processes of the agency that owns the site (e.g., County Parks Master Plan).

Until the first reserve unit management plan is developed and formally approved by the Wildlife Agencies, reserve lands will be managed in the interim to maintain and improve covered species habitats in accordance with the guidance in the Plan, best available information, and management methods currently being used in the study area. Subsequent reserve units will be managed in the interim based on reserve unit management plans for other units of the Reserve System.



Until a reserve unit management plan is prepared, management regimes that existed prior to acquisition will continue until it can be shown through management on other Habitat Plan reserves or elsewhere in the study area, pilot studies, experimentation, or other relevant studies that changing management will benefit natural communities or covered species. If the pre-existing management was damaging the resource or resources contained in that reserve, interim actions, based on best available information, will be implemented immediately and continued until the specific reserve unit management plan is completed. For example, if a parcel was previously overgrazed, the stocking rate could be reduced to the point where it can reasonably be assumed that the modified level of grazing will sustain natural resources. The reserve unit management plan will then define the appropriate standards to provide for reserve enhancement in perpetuity.

As described in Chapter 9, development fees are the primary source of funding for management actions and other operational activities in the Reserve System. Due to the slow pace of development in the study area as a result of the recent recession, it is unclear whether development fees will be adequate to fully fund management of the Reserve System in the early years of Plan implementation. In the event that development fees cannot fully fund management in reserve units according to the requirements and guidelines in this conservation strategy, the Implementing Entity may conduct only essential management tasks and defer non-essential management tasks for up to 5 years from the first acquisition for each reserve unit, or when development fees become available, whichever comes first. Essential management tasks are defined as those tasks necessary to ensure that the reserve unit does not degrade below the existing condition at the time it was incorporated into the Reserve System in terms of natural land cover and covered species habitat. Existing conditions will be documented by the Implementing Entity through the pre-acquisition assessment and the site inventory, described in Chapters 7 and 8. Management in response to changed circumstances (i.e., remedial actions described in Chapter 10) cannot be deferred.

Reserve unit management plans will be working documents; accordingly, they will not preclude the modification of management measures prior to Plan updates in cases where adaptive management or new research identifies more effective techniques. The Implementing Entity will review and, where biologically appropriate, systematically revise reserve unit management plans at least every 5 years. This review will be based on an evaluation of the success of management methods (i.e., knowledge gained through the monitoring and adaptive management program) in achieving objectives of the reserve, as well as on results of other outside research. As applicable to each reserve unit, reserve unit management plans will include the following types of information.

### **Objectives of the Conservation Area**

Each reserve unit management plan will clearly identify the biological objectives for the reserve unit. Biological objectives for each reserve unit will be a subset of the biological goals and objectives of the Habitat Plan (**Table 5-1**). Each reserve unit management plan will also identify the conservation actions applicable to the reserve (**Table 5-2**).

## Vegetation Management

Each reserve unit management plan will describe reserve-specific objectives for the following goals.

- Reducing the abundance and distribution of invasive plants.
- Increasing or maintaining the abundance and distribution of covered plants, and of compatible native plants in general.
- As indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, reducing the fuel load of the reserve so that the risk to biological resources of catastrophic wildfire is at an acceptable level and the risk to adjacent urban areas is minimized (meeting all state and local requirements). The methods and intensity of fuel management will vary depending on the location of the reserve relative to human populations and structures; emergency vehicle access; and the sensitivity of resources in the reserve to fuel load reduction techniques (e.g., fuel breaks, prescribed fire, mowing). Because fuel load reduction in chaparral habitats may be problematic (i.e., high-quality chaparral habitat is frequently characterized by periodic wildfire), it may be necessary to establish buffers in which to implement fuel load reduction.
- Minimizing the impacts of vegetation management techniques on native biological diversity and covered species (some impacts on covered species from vegetation management are expected and are included in the take allowances provided in this Plan).

Each reserve unit management plan will identify the types of management actions and the implementation schedule required to achieve the vegetation management objectives. Anticipated methods for managing vegetation include, but are not limited to, the following.

- Livestock grazing.
- Prescribed burning.
- Mechanical mowing (e.g., mowing fire breaks near the end of the growing season around the margins of reserves or as an alternative to grazing in areas where livestock cannot be used; large-scale use of heavy machinery to remove vegetation will not be allowed).
- Hand removal of vegetation (e.g., to remove infestations of invasive plants and to increase abundance of early successional vegetation along dense riparian corridors downstream of reservoirs).
- Biological control agents, where biologically appropriate and when shown to have minimal risk to non-target native species.
- Application of herbicides (e.g., spot spraying to remove infestations of invasive plants). There may be a need to apply herbicides on a large scale (e.g., to control yellow star-thistle). Note that use of herbicides is not proposed for coverage in the Section 10(a)(1)(B) permits. Herbicide use should consider the County of Santa Clara Integrated Pest Management Program and Pesticide Use Ordinance Section B28-10.

Reserve unit management plans will also describe the ongoing vegetation management actions that must be undertaken to implement community-level actions required on each of the reserves. This chapter includes detailed recommendations for management techniques and principles grouped by natural community that must be incorporated appropriately into each reserve unit management plan. These measures describe management requirements and guidelines that will be applied to natural communities to benefit covered and other native species.

- Section 5.3.2 *Landscape Conservation and Management.*
- Section 5.3.3 *Grassland Conservation and Management.*
- Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management.*
- Section 5.3.5 *Oak and Conifer Woodland Conservation and Management.*
- Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management.*
- Section 5.3.7 *Wetland and Pond Conservation and Management.*

### **Management of Invasive Species**

Each reserve unit management plan will include a section on management of invasive species. This section will incorporate management tools for controlling and if possible eradicating invasive plants and animals. Actions to control invasive animals (bullfrogs, nonnative predatory fish and feral pigs) that are described in Section 5.3.2 will also be incorporated as relevant into individual reserve unit management plans. In addition, California tiger salamander hybrid management, discussed in **Appendix K**, will be addressed in relevant reserve unit management plans.

### **Fire Management**

Each reserve unit management plan will include a section on fire management. The fire management section of each reserve unit management plan will include a description of minimum impact suppression techniques, which are described in more detail below. The plans will also include the following elements specific to each reserve:

- A map of fire access roads and gates.
- Identification of fuel-load management methods and criteria for their application.
- Criteria and procedures for use of prescribed fire for management purposes (burn plan).
- A description of fire-suppression criteria, procedures, resources, and responsibilities, including criteria for selecting fire-fighting water sources.
- A discussion of restoration/rehabilitation of vegetation following a fire.

Fire is an important natural component of local ecosystems. Therefore, some wildfires will be allowed to burn naturally to provide periodic disturbances that

will benefit natural communities and covered species, within the larger land-use context. The fire management component of each reserve unit management plan must include a clear decision system to determine when a wildfire will be left to burn and when it must be partially or wholly contained to prevent damage to structures, prevent injuries, prevent impacts to neighboring properties (including loss of forage and livestock), or cause excessive disturbance to natural communities.

The fire management component of each reserve unit management plan must be consistent with achieving the biological objectives of the reserve, as well as associated regulatory requirements. Reserve fire management components will be coordinated with the California Department of Forestry and Fire Protection (Cal-Fire) and any other firefighting agency that has responsibility for Reserve System lands. Copies of all fire plans, including maps of access roads, gates, and biologically sensitive areas, will be provided to all firefighting units. Additionally, the plans may include prescribed burn guidelines for management of fire-dependent natural systems. This would include coordination with other land management entities to assure adequate availability of burn permits from the Bay Area Air Quality Management District.

The development of the fire management component of each reserve unit management plan will include, based on the location of existing access roads and gates, an assessment of the need to develop additional fire access roads sited to minimize impacts on sensitive species and communities and to minimize the need for new access roads (which could affect sensitive species and communities) to be constructed under emergency conditions (i.e., during fires). In addition, all access gates will include common locks, inventoried and regularly checked by the Implementing Entity, which will allow for ready access by firefighting agencies.

### **Maintenance of Infrastructure**

Each reserve unit management plan will include a map showing the location of infrastructure, such as livestock grazing infrastructure, roads, firebreaks, fences, gates, pumps, wells, water control structures, ditches, canals, drains, powerlines, and buildings. The reserve unit management plan will include a schedule for inspecting infrastructure to determine the need for maintenance. Work needed to maintain infrastructure that is necessary for maintaining reserves (e.g., firebreaks, fences) will be conducted as soon as practicable after the need for maintenance has been identified. The reserve unit management plan will also identify periods during which maintenance activities will be conducted to avoid or minimize adverse effects on natural communities and covered species. Applicable avoidance and minimization measures described in Chapter 6 will also be applied. The Implementing Entity will include as a section in the reserve unit management plan a hazardous materials management/spill prevention plan to identify procedures that must be followed if hazardous materials are encountered or a spill occurs on the reserve.

### **Monitoring Requirements and Adaptive Management**

Each reserve unit management plan will include monitoring and adaptive management for the species, threats, and management actions within the reserve.

All management actions described in the reserve unit management plan will take into account the adaptive management program described in Chapter 7. Reserve unit management plans will include a description of how the results of the effectiveness monitoring will be used to adjust management of the reserve unit within the decision-making structure of the adaptive management process.

### **Recreational Use**

The participation of County Parks and the Open Space Authority in the conservation strategy requires that public access be permitted within the Reserve System. For Reserve System lands that permit public access, each reserve unit management plan will address recreational use that is compatible with the preservation and enhancement of natural communities, covered species, and biological diversity on the reserve. The recreation component of the reserve unit management plan will apply the allowances and restrictions described in Condition 9 to the management unit.

### **Agricultural Lands**

The Habitat Plan does not require acquisition of cultivated agricultural lands (i.e., grain, row-crop, hay, disk/short-term fallowed land cover type or irrigated pastures). However, acquisition of a larger site could include some cultivated agricultural land. For reserves that include cultivated agriculture, each reserve unit management plan will describe the agricultural practices that will be undertaken to ensure the land's compatibility with the Habitat Plan. The reserve unit management plan will also include limitations on permitted practices to reduce adverse effects of some practices on covered and other native species. Ongoing agricultural practices will be allowed if they are compatible with the goals and objectives of this Plan. If these ongoing agricultural practices are not compatible with the goals and objectives of this Plan, the parcel will either not be incorporated into the Reserve System or portions of an individual parcel with incompatible uses will be excluded from the Reserve System. Agricultural lands receive credit and enrollment into the Reserve System only if the site supports the biological goals and objectives of the Plan.

The key elements of the agricultural component (e.g., conservation goals and standards) will be negotiated with the landowner and included in the conservation easement when this form of ownership interest is acquired. The agricultural component will include details on the techniques and tools that will be used to achieve these goals. See Chapter 8 for the required elements of these easements, including the prohibitions on uses that would degrade the conservation value of the easement land. Preparation of reserve unit management plans will include opportunities for public review and comments.

### **Mosquito Abatement**

Any mosquito control activities to be performed on Reserve System land will be addressed in the reserve unit management plan in consultation with the Santa Clara County Vector Control District. The Implementing Entity will work with the Santa Clara County Vector Control District to create a unified mosquito control strategy that will apply to the entire Reserve System. All reporting requirements will be consistent with those required by the Santa Clara County Vector Control District and the U.S. Department of Agriculture. The reserve unit

management plan will include specific detail related to that unit. It will also explain specific measures implemented to avoid and minimize impacts to covered species consistent with the Habitat Plan.

## 5.2.6 Alternative Conservation Strategies

To facilitate the decision-making process, three alternative conservation strategies were developed that served as the basis for the preferred conservation strategy described in this chapter. Before the alternatives were developed, the Permittees established the following criteria, all of which had to be met for an alternative conservation strategy to be considered.

- Meet all applicable regulatory standards of ESA and the NCCP Act.
- Be technically feasible.
- Provide real choices in action and cost.
- Reflect the range of preferences of local agencies and stakeholders.
- Be easily distinguishable (i.e., vary as few parameters as possible).
- Support the CEQA/NEPA process, if possible.

Affordability was considered as a criterion and the Permittees felt that, while the preferred alternative must be affordable, it may be useful to have an alternative that is potentially unaffordable. Such an alternative helps to establish the “maximum practicable” conservation strategy, as required by ESA.

The alternative strategies developed differed primarily in the amount and location of land acquisition required. The details of the three alternative conservation strategies were released in June 2007 in the preliminary working draft of Chapter 5. Land acquisition ranged from 30,000 acres in Alternative 1 to 40,000 acres in Alternative 2 to 58,000 acres in Alternative 3. The alternatives also differed in the amount of existing open space incorporated into the Reserve System. Alternative 1 relied heavily on existing open space while Alternative 3 did not rely on any existing open space; Alternative 2 relied on a moderate amount of existing open space for the Reserve System. The three alternative conservation strategies were considered by the Wildlife Agencies and the Stakeholder Group in a series of meetings between July 2007 and June 2008 and through written comments. The public was also given the opportunity to review the alternative conservation strategy at a public meeting on September 26, 2007.

To develop the preferred conservation strategy, elements were taken from each alternative to best meet the biological goals and objectives of the Plan with the least cost. Although Alternative 3 would result in the greatest benefit to the covered species and natural communities, it was determined that this alternative was unaffordable and would result in infeasible development fees. The preferred land acquisition strategy, as described below in Section 5.3.1 *Land Acquisition and Restoration Actions*, combines elements from all three alternatives but mostly falls between Alternatives 2 and 3 in scale and scope.

## 5.2.7 Data Sources

The primary sources of data for the conservation strategy were the ecological accounts of covered species (**Appendix D**), the species distribution models (**Appendix D**), and the inventory of existing conditions summarized in Chapter 3. Other sources consulted to develop the conservation strategy are cited throughout the chapters. Additional general sources are listed below.

- Species recovery plans, if available (California Red-Legged Frog [U.S. Fish and Wildlife Service 2002], Least Bell's Vireo [U.S. Fish and Wildlife Service 1998b], Serpentine Soil Species of the San Francisco Bay Area [U.S. Fish and Wildlife Service 1998c], Upland Species of the San Joaquin Valley [U.S. Fish and Wildlife Service 1998a]).
- Species and natural community experts, including the independent Science Advisors for the Plan.
- Approved or in-process HCPs for adjacent or nearby areas with similar natural communities and covered species (e.g., San Francisco Public Utilities Commission Alameda Watershed HCP (ICF International 2010a) [in process], Pacific Gas and Electric Company Bay Area Operations and Maintenance HCP (ICF International 2010b) [in process], East Contra Costa County HCP/NCCP (Jones & Stokes 2006) [approved]).
- Local land acquisition priorities of open space agencies and organizations, where they overlap with the biological goals and objectives of the Plan: County Parks (County of Santa Clara 1987), Open Space Authority, The Nature Conservancy (The Nature Conservancy 2004, 2006b), National Audubon Society (National Audubon Society 2008), and Peninsula Open Space Trust.
- Management or mitigation plans for large-scale projects in the study area that address biological goals and objectives similar to those of the Plan (e.g., Kirby Canyon landfill, SR 152/156 Interchange).

## 5.3 Conservation Actions

The conservation strategy is composed of a series of *conservation actions*. Conservation actions are tools, strategies, comprehensive programs, and actions to conserve natural communities, habitats, and landscape-level processes and to conserve and help recover covered species in the study area. Tiering off of the biological goals and objectives (Section 5.2.1 *Biological Goals and Objectives*), conservation actions also occur at the landscape-level, natural community-level, and species-level. Conservation actions are grouped into two major categories—land acquisition actions and management actions—and are given unique labels and numeric codes according to their topic area. All conservation actions are listed sequentially in **Tables 5-2a and 5-2b**. The relationship of these conservation actions with the biological goals and objectives is presented in at the landscape-level (**Table 5-1a**), the natural community-level (**Table 5-1b**) and species-level (**Tables 5-1c and 5-1d**). Included as management actions are

studies that will address key management questions related to the covered species and natural communities (**Table 5-2b**). The results of these studies will be incorporated into the adaptive management process described in Chapter 7. Therefore, management actions will be adjusted in response to the results of these studies.

The following subsections describe in detail the landscape-level and natural community-level conservation actions. Section 5.4 *Benefits of and Additional Conservation Actions for Covered Species* relates the landscape-level and natural community level conservation actions to each covered species, while also discussing in detail the species-level conservation actions.

### 5.3.1 Land Acquisition and Restoration Actions

An important part of the conservation strategy is the creation of a Reserve System. Many parts of the Reserve System will link existing protected areas with newly protected lands. When completed, this Reserve System will protect substantial areas of high-quality habitat for covered species and will provide extensive new opportunities for habitat enhancement, restoration, and creation. The term “land acquisition” includes acquisition of all aquatic land cover types including wetlands, ponds, and streams.

All lands in the Reserve System will be enhanced, as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, to improve habitat for covered species and natural communities. The details of habitat enhancement activities are described starting in Section 5.3.2 *Landscape Conservation and Management*. Habitat restoration and creation will occur in targeted sites for wetlands, streams, and ponds as described in Sections 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management* and 5.3.7 *Wetland and Pond Conservation and Management*.

The land acquisition process is described in Chapter 8, Section 8.6 *Land Acquisition*. All land acquisition will be proposed to CDFG and USFWS for review and approval to ensure consistency with the biological goals and objectives.

## Acquisition Requirements by Land Cover Type

### Acquisition Requirements for Terrestrial Land Cover Types

The minimum land acquisition required under the Habitat Plan for terrestrial land cover types is 32,850 acres, as shown in **Table 5-11**. Additional minimum land acquisition requirements apply to some conservation analysis zones and for aquatic land cover types, as described below. Actual acquisition of some land cover types will likely be greater than the combined minimum requirements



because parcel boundaries typically do not follow ecological boundaries, and the boundaries of acquired parcels will include land cover types that are not specified by acquisition requirements<sup>12</sup>. In addition, qualitative requirements for habitat connectivity or for preservation of plant occurrences could require additional acreage.

All terrestrial land acquisition must be accomplished by Year 45 of the permit term. This requirement is in place to ensure that all lands incorporated into the Reserve System have at least 5 years to be managed, enhanced, and monitored according to the terms of the Plan before the permits expire. This time period will enable the Wildlife Agencies to closely monitor the final land acquisitions to ensure the Implementing Entity will complete the land acquisition strategy and achieve the final biological goals and objectives. Management of these lands however, will occur in perpetuity.

To estimate the actual extent of the Reserve System, the amount of land that would need to be acquired to meet all the requirements of this Plan was estimated. The actual size of the Reserve System will be different than the estimated amount because of the uncertainty in which parcels are acquired. Regardless of the final Reserve System size, all land acquisition requirements described in this chapter must be met by Year 45 of the permit term.

## **Acquisition and Restoration Requirements for Aquatic Land Cover Types**

As described above, the primary approach to conservation of terrestrial land cover types is through preservation and enhancement of lands based on regional estimates of impacts and the conservation needs of the covered species and natural communities. The approach to mitigating and conserving aquatic land cover types (wetlands, ponds, streams, and riparian woodland and scrub) differs from the approach to other land cover types. As described in Chapter 4, there is greater uncertainty in the degree of impact on aquatic features than on other land cover types. This is due, in part, to the uncertainty in some of the land cover mapping (particularly regarding wetlands; see **Table 3-4**). It is also due to the coarse scale of development designations within the local jurisdictions relative to the scale of these aquatic features. For example, even though an area may be designated for residential development, it is anticipated that residential projects will, for the most part, avoid riparian woodland and streams within their boundaries. Because it is difficult to predict the level of onsite avoidance, the Habitat Plan utilizes conservation ratios that are tied to actual impacts during Plan implementation to determine the necessary level of conservation.

All wetlands, ponds, and streams to be affected or preserved will be delineated in the field prior to impacts or acquisition as described in Section 6.8.4. Delineations may not always be feasible prior to acquisition for the Reserve System. Since land will be acquired on a willing seller basis, the Implementing

<sup>12</sup> For example, a 1,000-acre parcel may have required land cover types on 950 acres. Therefore, the remaining 50 acres of the parcel would not count towards Plan requirements.

Entity will need to respond quickly and may not always have the opportunity to conduct a pre-acquisition delineation. If infeasible, a delineation would occur within one year of acquisition. To offset impacts on these aquatic land cover types, the Implementing Entity will acquire these land cover types in-kind within reserves according to the ratios in **Table 5-12**. As with terrestrial land cover types, all aquatic land cover types must be acquired by Year 45. This requirement is in place to ensure that all lands incorporated into the Reserve System have at least 5 years to be managed, enhanced, and monitored according to the terms of the Plan before the permits expire. This time period will enable the Wildlife Agencies to closely monitor the final land acquisitions to ensure they will complete the land acquisition strategy and achieve the final biological goals and objectives.

To ensure a minimum level of protection of wetlands and other aquatic land cover types and ensure contribution to recovery for the covered species, regardless of the level of impact, the Implementing Entity must acquire at least 250 acres of riparian forest and scrub, 40 acres of central California sycamore alluvial woodland, 10 acres of coast and valley freshwater marsh (perennial wetland), 5 acres of seasonal wetland, 50 acres of ponds, and 100 miles of streams as shown in **Table 5-13**. Because there is a finite amount of these relatively rare land cover types in the study area not already protected in open space, the minimum protection levels can be met through preservation needed for mitigation. In addition, the preservation ratios for aquatic land cover types include a recovery component. For example, if all 25 acres of impacts occur to coastal and valley freshwater marsh, then 50 acres of this land cover type must be preserved in the Reserve System. Because of the limited availability of this land cover type, the minimum preservation of 10 acres will be fulfilled by the preservation of 50 acres (i.e., it may be infeasible to make the mitigation and minimums additive). In another example, if only 2 acres of impacts occur to coastal and valley freshwater marsh, then the minimum of 10 acres of preservation must occur (applying the mitigation ratio of 2:1 only reaches 4 acres of preservation).

Aquatic land cover types will also be restored or created according to the ratios in **Table 5-13**. Guidelines for restoration and creation for each natural community are described in the sections below on each natural community. All restoration and creation construction must be completed by Year 40 of the permit term. This requirement is in place to ensure that there is at least 10 years before the end of the term in which to monitor success criteria and take remedial actions in the event that success criteria are not being met.

To ensure a minimum level of restoration or creation that will contribute to species recovery, the Implementing Entity will restore or create 50 acres of riparian woodland, 20 acres of freshwater marsh, 20 acres of ponds, and 1 mile of streams (**Table 5-21**). These restoration and creation requirements are in addition to those required to offset impacts to these land cover types. To ensure that the Implementing Entity makes steady progress towards the final minimum creation and restoration goals, interim deadlines are established for each of the five applicable land cover types (**Table 5-14**). Interim deadlines are established for Years 15, 30, and 40.

Wetlands and streams exhibit a high degree of biological, physical, and hydrologic diversity in the study area. Consequently, it is important to preserve, enhance, restore, or create the full diversity of these land cover types as they occur in the area. Wetland delineations conducted prior to wetland impacts will be used, in part, to classify wetland types lost to ensure that the same types are being acquired and restored or created within Habitat Plan reserves. In addition, vegetation in wetlands and streams will be classified at the association or alliance level (rather than as a single land cover type) in order to help ensure that a diversity of communities is preserved.

Limits on impacts on aquatic land cover types are described in **Table 4-2** and preservation will occur in accordance with the preservation ratios in **Table 5-13**. Preservation ratios were determined on the basis of the following factors.

- The rarity and irreplaceability<sup>13</sup> of the land cover type within the inventory area (rarer and more irreplaceable land cover types have higher ratios).
- The biological value of the land cover type (e.g., overall biological diversity, function as habitat for covered species, ecosystem function).
- Mitigation ratios previously accepted by state and federal regulatory agencies (these ratios were used as starting points for this Plan).

Avoidance and minimization of impacts on aquatic land cover types (see Chapter 6) at project sites may reduce the amount of preservation area required if preserved aquatic land cover types meet minimum distance requirements from dense urban development (see *Buffer Zones within the Reserve System* below). Note that project proponents who receive take authorization under this Plan and who wish to fill jurisdictional wetlands and waters must obtain separate permits and certification from USACE and the Regional Board, respectively, to comply with CWA Sections 404 and 401, and may also need permits from the Regional Board under the Porter-Cologne Water Quality Control Act and a streambed alteration agreement with CDFG under California Fish and Game Code Sections 1600 et seq.

## Buffer Zones within the Reserve System

### Fuel Buffers

When the Implementing Entity acquires land adjacent to existing or planned urban development<sup>14</sup> that has no buffer zone, or an inadequate buffer zone, one may be created on the reserve according to the terms described in Chapter 6, Section 6.4.6, subheading *Condition 10 Fuel Buffer*. The buffer zone will experience a reduction in habitat function due to the indirect effects of urban development (see Chapter 4). To account for this loss of habitat function, any area adjacent to development that is disked, mowed, and/or sprayed with herbicides for fuel management will not be credited toward land acquisition

<sup>13</sup> A habitat or land cover type is irreplaceable if it cannot be restored or created elsewhere due to unique soil requirements, topography, or other conditions.

<sup>14</sup> Defined as the planning limit of urban growth (see Chapter 2) or the Urban Service Area, whichever is greater.

requirements (see Chapter 6 for required fuel buffers). The remainder of any buffer zone may be credited toward terrestrial land cover because it will provide habitat for some species and serve an important function. However, aquatic land cover types and aquatic covered species breeding habitat without sufficient buffer zones will not be credited toward meeting preservation requirements because their proximity to intensive urban development can greatly reduce their habitat value. See **Table 5-15** for minimum setback distances required for aquatic land cover types to be counted toward Plan requirements for preservation and restoration or creation (**Table 5-12**).

### Plant Occurrence Buffers

In order for a plant occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses. Adverse land uses include permanent land uses that could endanger the long-term viability of the plant occurrence; including urban development, landfill, and other intensive land uses. A 500-foot buffer was recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c), and this same buffer has been extended to the only covered plant not restricted to serpentine soils, the Loma Prieta hoita.

This buffer may be reduced under specific circumstances where, based on documented site conditions, plant occurrences are protected from adverse land uses by another means. For example, a reduced buffer may protect the viability of a plant occurrence if a major physical barrier separates the occurrence from adjacent land use. Conversely, the buffer may need to be increased in specific circumstances where, based on documented site conditions, plant occurrences are not afforded adequate protection from adjacent land uses. For example, to minimize hydrologic effects of adjacent land use on an occurrence located down-gradient, a buffer exceeding 500 feet may be necessary. Adequacy of the 500-foot buffer will be determined by the Implementing Entity, in coordination with the Wildlife Agencies. Buffers surrounding protected plants will also expand as plant occurrences expand, assuming space is available after covered activities are completed. In other words, occurrence expansion will not result in a reduced buffer.

### Incorporating Covered Plant Species

The locations of all covered plants within the study area are not known due to survey and mapping limitations. Habitat distribution models were developed for 6 of the 9 covered plant species (see Chapter 3 and **Appendix D**), but the conservation value of these models is limited because of the paucity of known occurrences of most species in the study area. The habitat requirements of the remaining species are not well known enough to develop a credible model at this time. Many covered plants likely have unique microhabitat requirements such as soil types or plant associations that cannot be mapped at the regional scale used in this Plan.

Despite model limitations, for compliance purposes, impacts on all covered plants will be limited by known *occurrences* (**Table 4-6**) and modeled habitat for

the 6 covered plants for which habitat models were developed (**Table 4-4**) if additional occurrences are not discovered during the permit term. Similarly, mitigation and conservation will be based on known occurrences (**Tables 5-16**) and modeled habitat (**Table 5-17**). Additional known occurrences and new occurrences not yet discovered at the time of permit issuance can be impacted up to the limits described in **Table 5-16** and in accordance with the criteria described below. For all but one covered species, a plant occurrence is defined as a group of individuals that are separated by at least 0.25 mile from other groups of individuals of the same species or subspecies. This definition was used to be consistent with how plants are tracked by the CNDDB, and to facilitate compliance monitoring by the Plan (see Chapter 7). For Santa Clara Valley dudleya, a distinct occurrence is ecologically a group of individuals on a rock outcrop. These rock outcrops often occur less than 0.25 mile from each other. A different definition of an occurrence was used for this species because of its unique clumped distribution on rock outcrops.

In some cases, an occurrence may be equivalent to a population; in other cases, multiple occurrences may form a single population. A biological population is defined differently for each of the covered plants and is often unknown due to a lack of population data. Therefore, an occurrence provides a single standard by which to measure impacts and conservation for all covered plants. During implementation, the Implementing Entity may conduct monitoring or management actions based on populations, which is a more biologically meaningful unit.

The Implementing Entity must ensure that adequate numbers of occurrences of covered plants are protected in the Reserve System. The conservation strategy for each plant species includes the acquisition (preservation) and/or creation of covered plant occurrences. Both acquired and created occurrences will be permanently protected in the Reserve System. Land containing occurrences of covered plants will be acquired from willing sellers in fee title or through establishment of conservation easements.

Almost all known occurrences of covered plants in the study area are found outside the planning limit of urban growth and away from the footprint of covered activities. Therefore, many occurrences are expected to be included in the Reserve System as it is established. However in order to ensure that covered plant occurrences are protected, the land acquisition actions listed below include specific requirements for covered plants.

Preservation of covered plant occurrences must occur ahead of the impacts to each plant species, as described in the Stay-Ahead provision in Section 8.6.1 *Stay-Ahead Provision*. Impacts to all plants, with the exception of the Coyote ceanothus (see Section 5.4.11) will be offset by the acquisition of occurrences of the same species that is at least equivalent in size<sup>15</sup> and of the same or better “condition” than the impacted occurrence. The number of occurrences that must

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<sup>15</sup> Measured as either plant cover or number of individuals, whichever is most appropriate for the species and site. The occurrence size that must be matched or exceeded is the occurrence size at the time of impact, which may be different from the known occurrence size during the development of this document.

be acquired prior to impacts will be in accordance with the Plan's species-specific mitigation ratios (**Table 5-16**). For example, although the Plan proposes to preserve 55 occurrences of Santa Clara dudleya if additional occurrences were not discovered during the permit term, four occurrences of equal or greater size and same or better condition must be acquired prior to each impact. In other words, all 55 occurrences of Santa Clara dudleya do not need to be acquired prior to the first impact. Acquisition ratios were not developed for the Tiburon Indian paintbrush, Coyote ceanothus, and Metcalf Canyon jewelflower, the three plant species for which additional impacts are not covered by the Plan even if additional occurrences are discovered during the permit term. For more details, refer to species-specific acquisition timing requirements in Section 5.4 *Benefits of and Additional Conservation Actions for Covered Species*.

If the Implementing Entity cannot protect the necessary plant occurrences, then proponents of projects that will have impacts on covered plants will be required to protect the covered plant occurrences in order to receive take authorization under this Plan for any covered species.

To ensure that the Plan adequately protects covered plants, site-specific surveys in impact areas (described in Chapter 6), and site inventories conducted in new reserves, will document the presence, absence, and condition (as defined below) of occurrences of covered plants. When known, this information will also inform the land acquisition process. Field assessments will consist of one season of surveys for all species, except when there is evidence that a single season may not provide adequate information to make a reliable assessment of condition as defined below. Reasons for a second season of surveys could include:

- Extreme weather (e.g., unusually low or high rainfall), fire, or other natural condition or disaster during the survey year that creates unusual negative or positive growing conditions.
- Disease appears to be affecting greater than 50% of an occurrence, especially of woody species.

For the purposes of this Plan, "good condition" of a covered plant occurrence is defined as a high potential to increase in size with improved management. The condition of a plant occurrence will be assessed in the field by a qualified botanist on the basis of the characteristics listed below.

- **Physical health.** Individuals in good or excellent physical health (e.g., little or no signs of disease, viruses, severe herbivory, nutrient deficiencies) are more likely to survive, achieve an average or above-average lifespan, and reproduce successfully than individuals in poor physical condition. Plants in good physical health generally also indicate a highly suitable site.
- **Age structure.** Occurrences of perennial species with an age distribution that includes many seedlings or juvenile plants relative to adults suggests a stable or positive rate of occurrence growth. Additionally, for annual and perennial species, seeds or bulbs in the soil (i.e., the seed bank) are also part of a plant occurrence's age structure, but this component is generally very difficult to assess.

- **Reproductive success.** Occurrences with evidence of average or above-average reproductive success for the species (e.g., production of flowers per plant, seed production per flower or per plant, proportion of seeds that appear to be viable based on visual observations) are more likely to be increasing than occurrences with below-average reproductive success, because this is often a key component of occurrence growth rate. If reproductive success cannot be measured, plant size or other physical features may be an appropriate surrogate in some covered species.
- **Availability of suitable habitat.** In order for a plant occurrence to remain stable or grow, enough suitable habitat must be present. Occurrences near unoccupied suitable habitat or without evidence of shrinking suitable habitat areas (e.g., nonnative plant populations that may be expanding, native shrubs that may be advancing) will be considered in better condition than occurrences without these indicators.
- **Diversity of suitable habitat.** Occurrences that occupy a wide range of microhabitats for the species may exhibit relatively high genetic diversity and therefore occurrence condition. Occurrences that occupy unusual microhabitats for the species may indicate unusual genetic composition or adaptations that should be protected.
- **Threats.** Threats to occurrences within the Reserve System will be assessed to ensure that protection and improved management will not be undermined by external factors such as disease, severe herbivory, recreational uses, or adjacent land uses. Occurrences in danger from threats that can be addressed should be considered in better condition than those that cannot be addressed.

The location of affected plant occurrences and the location of the preserved or created plant occurrences will also be taken into consideration by a qualified botanist. In some cases, it may be beneficial to preserve occurrences that would expand the current range of a species. In other cases, preservation of genetic integrity in a specific locality may have more conservation value. The Implementing Entity will consult the Wildlife Agencies on the location of preserved and created occurrences to ensure that the biological goals and objectives of each species are met.

Sites selected for preservation of plant occurrences in good condition will be incorporated into the Reserve System to ensure long-term viability of these occurrences. Reserves will contain sufficient suitable habitat for the covered plant to support occurrence expansion and fluctuation and to apply beneficial management techniques such as appropriate disturbance regimes.

When practicable, all lands protecting covered plant occurrences will be connected to existing protected areas or Habitat Plan reserves. When not practicable, the minimum reserve size to protect covered plant occurrences will be determined on the basis of site-specific conditions but will not be less than 40 acres unless acquiring a smaller site is the only way to meet a land-acquisition requirement in this Conservation Action (i.e., all other options have been exhausted). The minimum reserve size required for the long-term viability of covered plant occurrences will vary depending on species, site conditions,

occurrence status, and surrounding land uses but will generally be unknown. A 40-acre minimum has been established because it is a common parcel size in the study area (1/16 of a section) and because this is the estimated minimum size needed to properly manage a site in the study area. Because land acquired for the Reserve System must be linked to other Habitat Plan reserves or existing public lands whenever possible, few, if any, isolated, 40-acre reserves will be established. Additionally, reserves must be configured to minimize the extent of edge (e.g., rectangles, squares, or circles instead of strips or fragments).

Created occurrences will not count toward the Stay-Ahead provision for plants and will not be used to mitigate adverse effects, with the exception of the Coyote ceanothus. Created plant occurrences will therefore only contribute to species recovery due to the highly experimental nature of this technique.

## Land Acquisition Requirements by Conservation Analysis Zone

To ensure that acquisition occurs in locations that will maximize the benefits to natural communities and covered species, acquisition requirements are also defined by conservation analysis zone (**Figure 5-5**) or by a combination of zones. In addition to numeric land acquisition requirements by land cover and zone, qualitative land acquisition requirements are provided for some zones. For instance, linkage of existing public lands or preservation of covered plant occurrences could be required. The requirements for land acquisition within the zones or groups of zones are described below, generally from north to south in the study area. The relevant acquisition actions from **Table 5-2a** are also referenced.

The proposed land conservation strategy is shown in **Figure 5-7**. **Table 5-18** describes land acquisition and enhancement requirements for select conservation analysis zones where geographic specificity was required to ensure that Plan goals and objectives were met. This figure illustrates the relative level of land acquisition effort that would occur in each of the conservation analysis zone (high, moderate, or low) based on the specific land acquisition requirements described below. The landscape linkages protected or partially protected by the land conservation strategy are shown in **Figure 5-8** (linkages correspond to those in **Table 5-9** and **Figure 5-6**).

### Alameda-1 and Coyote-7

The Alameda-1 conservation analysis zone lies at the northern edge of the study area in the Alameda watershed. This zone is combined with the adjacent Coyote-7 zone for the purposes of the land acquisition strategy because together they create an important linkage outside the study area. In addition, land cover types and species habitat in the two zones are similar. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.



- Enhance connectivity and linkage between large blocks of existing open space in the northeast corner of the study area and the large network of existing open space adjacent to the study area to the north (Linkage 4 in **Table 5-9** and **Figure 5-8**) (LAND-L7).
- Protect large stands of valley oak woodland (LAND-OC3).
- Protect stands of northern coastal scrub/Diablan sage scrub (LAND-C3).
- Protect upper watershed tributaries of Upper Penitencia Creek (important breeding habitat for foothill yellow-legged frog) and Cherry Flat Reservoir (LAND-L1, LAND-R5).
- Protect an area with a high density of ponds and likely breeding habitat for California red-legged frog, California tiger salamander, and western pond turtle (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5, LAND-WP3a, LAND-WP3b, LAND-WP6a, LAND-WP6b).
- Protect designated critical habitat for California red-legged frog and California tiger salamander (LAND-WP4).
- Protect elevation gradients in the north of the study area under threat from rural residential development (LAND-L2a, LAND-L2b, LAND-L-2c, LAND-L2d).

Land acquisition in these conservation analysis zones will expand the existing open space in the northeast corner of the study area and provide an important linkage to more than 75,000 acres of contiguous protected areas to the north in Santa Clara and Alameda Counties. Acquisition in this area also provides a unique opportunity to protect extensive stands of valley oak woodland, critical habitat for three covered species, and elevation gradients, all with moderate amounts of acquisition. Acquired lands are expected to have excellent potential for freshwater marsh restoration and pond creation.

The specific land acquisition requirements for these conservation analysis zones are shown below.

- Acquire natural land cover types in the two conservation analysis zones as shown in **Table 5-18**.
- Land must be acquired to connect existing open space adjacent to the conservation analysis zones to the north and south.
- The landscape linkage between the study area and SFPUC lands to the northwest must be widened to at least 1.0 mile.

### Guadalupe-1 and -3

Guadalupe-3 is one of the largest conservation analysis zones in the study area. However, this zone is largely composed of urban development in San José. The southern edge of Guadalupe-3 supports small but important patches of serpentine grassland, including the north side of Tulare Hill. Guadalupe-1 is combined with Guadalupe-3 for the purposes of the land acquisition strategy because of the

similar land cover types found along their borders. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.

- Link large block of protected lands south of Calero Reservoir with Almaden Quicksilver County Park and extensive protected lands outside the study area to the west in the Santa Cruz Mountains (Linkage 9 in **Table 5-9** and **Figure 5-8**) (LAND-L8).
- Complete the linkage between the Diablo Range and the Santa Cruz Mountains across Tulare Hill (Linkage 8 in **Table 5-9** and **Figure 5-8**) (LAND-L4, LAND-WP7).
- Protect and enhance important stands of serpentine grassland and serpentine chaparral (LAND-C2).
- Protect and enhance watershed functions in the Guadalupe Watershed (LAND-L3).
- Protect stands of northern coastal scrub/Diablan sage scrub (LAND-C3).
- Protect freshwater perennial marsh and seasonal wetlands (LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).
- Protect important occurrences and suitable habitat of covered plants, including Mt. Hamilton thistle, Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, and Santa Clara Valley dudleya (LAND-P2, LAND-P3, LAND-P4, LAND-P5, LAND-P6, LAND-P7, LAND-P10).
- Protect important habitat and designated critical habitat for Bay checkerspot butterfly (LAND-G3).
- Partner with various public agencies in north San José (e.g., San José Water Pollution Control Plant, VTA) to protect and maintain the second largest population of western burrowing owls in the study area (LAND-G6).
- Protect the watershed of Alamitos Creek and its tributaries (LAND-R5).

Land acquisition in these conservation analysis zones achieve multiple goals and objectives with relatively low levels of land acquisition. First, many occurrences of covered plants can be protected and possibly enhanced with strategic acquisitions. Second, important potential habitat for Bay checkerspot butterfly would be acquired so that improved management can attract butterflies and expand their range locally.

Finally, key acquisitions can also provide important linkages among the existing network of open space in and adjacent to the study area. These acquisitions can also serve as important buffers between existing and future urban areas and extensive open space in the Santa Teresa Hills and Santa Cruz Mountains.

The land acquisition requirements for these conservation analysis zones are listed below.

- Acquire serpentine grassland within the conservation analysis zones as shown in **Table 5-19**.

- Protect and enhance occupied and potential nesting habitat for western burrowing owl consistent with the burrowing owl conservation strategy described in Section 5.4.6 *Western Burrowing Owl*.
- Acquire at least 1,600 acres in the Guadalupe Watershed as a whole.
- Link Santa Teresa and Calero County Parks.

## Coyote-4

Conservation analysis zone Coyote-4 comprises much of the upper watershed of Coyote Creek above Anderson Reservoir (**Figure 5-5**), including some of San Felipe Creek and its tributaries, as well as a portion of Coyote Ridge. The primary purposes of the land acquisition strategy in this conservation analysis zone are listed below.

- Provide landscape linkage between Coyote Ridge and mid- to high-elevation natural communities in the Diablo Range (Linkage 7 in **Table 5-9** and **Figure 5-8**).
- Protect linkage between J. Grant Park and Henry Coe (Linkage 5 in **Table 5-9** and **Figure 5-8**)
- Protect and enhance important stands of valley oak and blue oak woodland (LAND-OC3), mixed oak woodland and forest (LAND-OC1), and annual grassland (LAND-G2).
- Protect and enhance watershed functions in the Coyote Watershed (LAND-L3).
- Protect stands of northern coastal scrub/Diablan sage scrub (LAND-C3).
- Protect and enhance riparian forest along lower San Felipe Creek and its tributaries (LAND-R2, LAND-R5).
- Protect and enhance potential nesting and overwintering habitat for western burrowing owl, and potential breeding and foraging habitat for tricolored blackbird.
- Protect and enhance potential breeding habitat and extensive upland habitat for covered amphibians and western pond turtle (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5, LAND-WP3a, LAND-WP3b, LAND-WP5, LAND-WP6a, LAND-WP6b).
- Protect and enhance annual grasslands that support or could support California ground squirrels to provide food and shelter for covered and native species (LAND-G8).
- Protect freshwater perennial marsh and seasonal wetlands (LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).
- Protect designated critical habitat for California tiger salamander.

This conservation analysis zone is noteworthy because of its relatively high concentration of desirable land cover types: blue oak woodland, valley oak

woodland, riparian woodland (including high quality sycamore alluvial woodland) and forest, and ponds. Moreover, these areas are largely unsurveyed and may contain important undocumented occurrences of covered plants. Covered wildlife species known or with potential to occur in this area are California red-legged frog, California tiger salamander, western pond turtle, and foothill yellow-legged frog; extensive habitat for these species occurs in this conservation analysis zone. Acquisition in this zone would also support a large proportion of the annual grassland in the Reserve System. These lands may also support secluded rock outcrops or large trees overlooking open grassland that would protect suitable nesting sites for golden eagle and other raptors.

The land acquisition requirements for this conservation analysis zone are listed below.

- Acquire natural land cover types in conservation analysis zone as shown in **Table 5-18**.
- Acquire serpentine grassland within the conservation analysis zones as shown in **Table 5-19**.
- Provide landscape linkage along Coyote Ridge between Anderson Lake County Park and the Silver Creek Hills (Linkage 6 in **Table 5-9** and **Figure 5-8**).
- Connect Coyote Ridge with the San Felipe Ranch Conservation Easement.

In 2008, creation of the San Felipe Ranch Conservation Easement protected all of the remaining unprotected ponderosa pine woodland in the study area. Therefore, no ponderosa pine woodland is available to protect in the Reserve System. There is also no impact expected to this land cover type.

## Coyote-5 and 6

Conservation analysis zone Coyote-5 encompasses the southern end of the Coyote watershed and the southern half of Coyote Ridge (**Figure 5-5**). Because this subwatershed spans Coyote Valley, it also includes the eastern extent of the Santa Teresa Hills and the lower foothills of the Santa Cruz Mountains west of Coyote Valley. Coyote-6 encompasses the northern half of Coyote Ridge and the immediate watershed of Silver Creek. The main stem of Coyote Creek below Anderson Dam is excluded from the conservation analysis zone because it occurs within several County parks. These conservation analysis zones were combined for the purposes of the land acquisition strategy because together they include all of Coyote Ridge and support most of the unprotected serpentine grassland in the study area. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.

- Provide landscape linkage across Coyote Ridge (Linkage 6 in **Table 5-9** and **Figure 5-8**).
- Enhance the landscape linkage from Coyote Ridge to Coyote Creek, facilitating connections across the Santa Clara Valley (Linkages 8 and 10 in **Table 5-9** and **Figure 5-8**).

- Protect and enhance watershed functions in the Coyote Watershed (LAND-L3).
- Provide a connection from Santa Teresa County Park to Calero County Park.
- Protect and enhance extensive serpentine grassland and serpentine chaparral along Coyote Ridge (LAND-L5, LAND-C2).
- Protect and enhance extensive occupied habitat for Bay checkerspot butterfly and designated critical habitat (LAND-G3).
- Protect freshwater perennial marsh and seasonal wetlands (LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).
- Protect and enhance occurrences of and suitable habitat for covered plants including Mt. Hamilton thistle, Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, fragrant fritillary, Loma Prieta hoita, Coyote ceanothus, and Santa Clara Valley dudleya (LAND-P1, LAND-P2, LAND-P3, LAND-P5, LAND-P6, LAND-P7, LAND-P8, LAND-P11).
- Protect and enhance annual grasslands that support or could support California ground squirrels to provide food and shelter for covered and native species (LAND-G8), including overwintering habitat for western burrowing owl.
- Protect and enhance upland habitat near and adjacent to Laguna Seca, a future wetland restoration site, for covered species that breed in coastal and valley freshwater marsh (e.g., tricolored blackbird, California tiger salamander, California red-legged frog, and western pond turtle).
- Protect upland habitat connections to Coyote Creek below Anderson Dam, an important regional wildlife linkage (Linkage 10 in **Table 5-9** and **Figure 5-8**).

Land acquisition in these two conservation analysis zones will protect and provide the opportunity to enhance 73% of the remaining suitable and occupied habitat for Bay checkerspot butterfly in Coyote-5 and Coyote-6. Land acquisition in these zones is essential to meeting the conservation objectives for this species. Serpentine grassland and chaparral in these zones also support at least eight covered plant species, sometimes in multiple occurrences; accordingly, conservation in these zones is essential to meeting the plant conservation requirements. To meet the plant conservation targets, serpentine grassland will be acquired on both sides of the Santa Clara Valley, protecting occurrences that may be disjunct from one another. Much of the serpentine chaparral in the Reserve System would be acquired in these zones.

Land acquisition in these conservation analysis zones would also protect and provide opportunities to enhance upland habitat near Laguna Seca. Historically, this large wetland complex was unique in the Santa Clara Valley, supporting a large freshwater marsh and large willow groves (San Francisco Estuary Institute 2006). This wetland complex will be restored by SCVWD to some of its historic condition in conjunction with the approved Coyote Valley Research Park development.

The valley floor between Tulare Hill and Anderson Reservoir is one of the narrowest points in the Santa Clara Valley between the Santa Cruz Mountains and the Diablo Range (Linkages 8, and 10 in **Table 5-9** and **Figure 5-8**). The land acquisition strategy in Coyote-5 focuses on protecting lands east and west of Coyote Creek to allow terrestrial and aquatic wildlife to continue to access and use that creek as a movement corridor (portions of both sides of the creek are already protected by County Parks). Additional land acquisition in the Coyote Valley could occur, but it is not required. As development intensifies on the valley floor in this zone west of the creek, Coyote Creek will increasingly become the primary corridor for terrestrial wildlife moving through the valley.

At least 24 undercrossings or culverts have been documented along this stretch of U.S. 101, most of which are small culverts associated with drainages from Coyote Ridge (though at least one is approximately 6 feet in diameter) (California Department of Fish and Game 2006). There are also two large underpasses that allow wildlife passage under U.S. 101. Many species of wildlife have been documented using these culverts recently, and most of the culverts are utilized by multiple species (T. Diamond pers. comm.). Of the 24 culverts along this stretch of U.S. 101, 19 have Type 1, 2, or 3 open space on both sides of the highway; the remaining five culverts have Type 1, 2, or 3 open space only on the west side of the highway (Coyote Creek Parkway, a County park). The land acquisition strategy in Coyote-5 targets protection of land that provides access to most of the remaining culverts. Management actions within the Reserve System could then focus on enhancing these corridors, as indicated by pre-acquisition assessments and targeted studies. The conservation strategy also includes actions to assess and improve wildlife connectivity in these conservation analysis zones; see Section 5.3.2 *Landscape Conservation and Management* subheading *Connectivity and Permeability*.

The land acquisition requirements for these conservation analysis zones are listed below.

- Acquire serpentine grassland within the conservation analysis zones as shown in **Table 5-19**. Serpentine grassland acquisition must occur on both sides of the Santa Clara Valley.
- Provide linkage between Santa Teresa County Park and Calero County Park.
- Protect at least 50 acres of serpentine grassland east of Santa Teresa County Park.
- Acquire the unprotected portions of the three unprotected occurrences of Coyote ceanothus within Coyote-5.
- Acquire either Kalana 1 or Kalana 2, 3, and 4 populations of Bay checkerspot butterfly (see **Table 5-7** and the species account in **Appendix D**) to protect and enhance habitat for Bay checkerspot butterfly.
- Acquire at least 75% of the currently unprotected portions of mapped habitat for Bay checkerspot butterfly at the Hale and Falcon Crest sites within Coyote-5 and Llagas-3 (see habitat map in species account in **Appendix D**).

## Llagas-3

Conservation analysis zone Llagas-3 comprises the northern half of the Llagas Basin subwatershed downstream of Chesbro Reservoir, mostly on the floor of the Santa Clara Valley. This zone includes the city of Morgan Hill and extensive agricultural areas of the valley. It also includes small but important patches of serpentine grassland and riparian woodland. The primary purposes of the land acquisition strategy in this conservation analysis zone are listed below.

- Protect and enhance habitat for Bay checkerspot butterfly on the west side of the Santa Clara Valley (LAND-G3).
- Protect and enhance potential breeding and overwintering habitat for western burrowing owl.
- Protect and enhance the largest population of Coyote ceanothus on the west side of the Santa Clara Valley (LAND-P1).
- Protect designated critical habitat for California tiger salamander (LAND-WP6b, LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).
- Protect occurrences of and suitable habitat for covered plants, including most beautiful jewelflower, Santa Clara Valley dudleya, and smooth lessingia (LAND-P2, LAND-P5, LAND-P7, LAND-P10).
- Provide riparian restoration opportunities along Llagas Creek for least Bell's vireo and other native songbirds (LAND-R2).

Land acquisition on the west side of the Santa Clara Valley within Llagas-3 is essential to meeting the biological objectives for protection of known populations of Bay checkerspot butterfly and Coyote ceanothus. Land acquisition in this area is also important to meeting several plant acquisition targets. Llagas-3 shares conservation targets with Llagas-4 and Uvas-2 for acquisition of critical habitat for California tiger salamander northwest of Gilroy. This area also supports extensive seasonal wetlands and has been proposed as a conservation and wetland mitigation bank (WRA Environmental Consultants 2008).

Land acquisition and riparian/stream restoration along middle Llagas Creek and Little Llagas Creek within Llagas-3 and 4 were considered but rejected. Much of the narrow Llagas Creek is already owned by SCVWD, but the restoration potential is limited by several factors. First, the creek is highly channelized and would therefore require extensive physical modification that may not be feasible in consideration of surrounding lands uses and small parcels. Second, as urban development in Gilroy expands to the east, the habitat value of Llagas and Little Llagas Creeks will diminish. Finally, one of the covered activities in this Plan is a flood protection project along Llagas Creek. While that project will be built to minimize adverse effects on wildlife and habitat, its increasing use as a flood conveyance facility limits its dual use as habitat for covered species. For these reasons, land acquisition and stream and riparian restoration was instead directed to stream reaches with greater potential for enhancement of stream and riparian functions such as Uvas Creek, Carnadero Creek, Lower Llagas Creek, the Pajaro River, and Pacheco Creek.

The land acquisition requirements for this conservation analysis zone are listed below.

- Acquire land in Llagas-3 to fully protect the occurrence of Coyote ceanothus found in this zone.
- Acquire serpentine grassland within the conservation analysis zones as shown in **Table 5-19**.
- Acquire at least 75% of the currently unprotected portions of mapped habitat for Bay checkerspot butterfly at the Hale and Falcon Crest sites within Llagas-3 and Coyote-7 (see habitat map in species account in **Appendix D**).

## Llagas-4

Conservation analysis zone Llagas-4 encompasses the southern half of the Llagas Basin, mostly on the floor of the Santa Clara Valley. For convenience, this zone also includes the northern edge of the adjacent watershed that extends into San Benito County (**Figure 5-5**). The primary purpose of the land acquisition strategy in this conservation analysis zone is to protect designated critical habitat for California tiger salamander (LAND-WP6b, LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).

Llagas-4 shares conservation targets with Llagas-3 and Uvas-2 for acquisition of critical habitat for California tiger salamander northwest of Gilroy. This area also supports extensive seasonal wetlands and has been proposed as a conservation and wetland mitigation bank (WRA Environmental Consultants 2008). See Llagas-3 for a discussion of why land acquisition along Llagas and Little Llagas Creek was not a priority within Llagas-3 and 4. There are no specific land acquisition requirements in Llagas-4.

## Pescadero-1

Conservation analysis zone Pescadero-1 is located at the southwest corner of the study area and encompasses all of the Pescadero watershed within the study area. This conservation analysis zone includes most of the headwaters of Pescadero Creek. The primary purposes of the land acquisition strategy in this conservation analysis zone are listed below.

- Protect the headwaters and streams of the Pescadero Creek watershed (LAND-L1, LAND-L3, LAND-R5).
- Protect and maintain high-quality redwood forest (LAND-OC6).
- Protect large stands of northern coastal scrub/Diablan sage scrub (LAND-C3) and annual grassland (LAND-G2).
- Protect and maintain high-quality riparian woodland in Pescadero Creek (LAND-R2).



- Facilitate the landscape linkage from the study area to the Lomerias Muertas Range (Linkage 19 in **Table 5-9** and **Figure 5-8**) and to the Gabilan Range (Linkage 20) (LAND-L19).
- Protect a portion of the linkage along the ridgeline of the Santa Cruz Mountains (Linkage 13).
- Protect and enhance habitat for California red-legged frog and western pond turtle in the Santa Cruz Mountains (LAND-WP5, LAND-WP6a, LAND-WP6b).
- Protect strong environmental gradients within the Santa Cruz Mountains (LAND-L2a, LAND-L2b, LAND-L2c, LAND-L2d).

In most years stream flow in Pescadero Creek is low, and some reaches are likely to be intermittent or dry. In wet years, most reaches along Pescadero Creek are flowing and are bordered by dense riparian forest that provides ample shade and in-stream woody debris that create pools for rearing and sheltering native fish, including juvenile steelhead. In-stream ponds and off-stream seasonal wetlands and ponds in this watershed likely provide habitat for California red-legged frog, California tiger salamander, and western pond turtle (H.T. Harvey & Associates 2006). The Pescadero watershed also supports stands of redwood forest, some of which may be unlogged.

Land acquisition in this watershed will protect large stands of riparian woodland and potential breeding habitat for least Bell's vireo, along with diverse land cover types in the southern Santa Cruz Mountains that range from California annual grassland to redwood forest to valley oak woodland. These lands may also support secluded rock outcrops or large trees overlooking extensive stands of annual grassland that would provide suitable nesting sites for raptors.

## Uvas-1, 2, 5, and 6

All the conservation analysis zones in the Uvas watershed are combined for the purposes of the land acquisition strategy. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.

- Protect headwaters of tributaries of Uvas Creek (LAND-L1, LAND-R5).
- Protect stands of northern coastal scrub/Diablan sage scrub (LAND-C3).
- Protect freshwater perennial marsh (LAND-WP3, LAND-WP1a, LAND-WP1b).
- Protect and enhance breeding habitat for California red-legged frog and western pond turtle in the Santa Cruz Mountains (LAND-WP5, LAND-WP6a, LAND-WP6b).
- Facilitate the landscape linkage from the study area to the Lomerias Muertas Range (Linkage 19 in **Table 5-9** and **Figure 5-8**) and to the Gabilan Range (Linkage 20) (LAND-L9).

- Protect a portion of the linkage along the ridgeline of the Santa Cruz Mountains (Linkage 13 in **Table 5-9** and **Figure 5-8**).
- Protect strong environmental gradients within the Santa Cruz Mountains (LAND-L2a, LAND-L2b, LAND-L2c, LAND-L2d).
- Protect and enhance watershed functions in the Uvas Watershed (LAND-L3).
- Protect stands of northern mixed chaparral (LAND-C1) and annual grassland (LAND-G2).
- Protect riparian woodland and opportunities for riparian woodland restoration along Uvas/Carnadero Creek and the linkage along the creek (Linkage 12) (LAND-R2, LAND-R5).

Land acquisition is planned above Uvas Reservoir to protect high-quality habitat for foothill yellow-legged frog, riparian woodland, and a relatively high diversity of natural communities with a relatively low intensity of rural development in the watershed. Land cover types above Uvas Reservoir include serpentine chaparral, blue oak woodland, foothill pine-oak woodland, and valley oak woodland. Land acquisition above Uvas Reservoir has the potential to create an unbroken landscape linkage from Uvas Reservoir to Santa Teresa County Park. Land acquisition in the Uvas watershed conservation analysis zones will also support populations of California red-legged frog and California tiger salamander in the Santa Cruz Mountains to ensure that populations on either side of the Santa Clara Valley are protected and managed.

The land acquisition requirements for these conservation analysis zones are listed below.

- Protect natural land cover types within the conservation analysis zones as shown in **Table 5-18**.
- Extend the Uvas Creek Park Preserve 1.6 miles upstream to Hecker Pass Highway (LAND-R1) and setback expected development adjacent to this stream segment consistent with the stream setback condition (see Chapter 6) to protect the Uvas Creek Corridor<sup>16</sup>.
- Protect at least 1.0 mile of Uvas Creek above Uvas Reservoir to protect and enhance habitat for foothill yellow-legged frog and California red-legged frog.

## Llagas-2

Conservation analysis zone Llagas-2 occurs around and upstream of Chesbro Reservoir and borders the eastern edge of the Cañada del Oro Open Space Preserve. The primary purposes of the land acquisition strategy in this conservation analysis zone are listed below.

- Protect riparian woodland in upper Llagas Creek (LAND-R5).

<sup>16</sup> This conservation action is consistent with Goals 5-5, 5-7, and 5-8 of the approved City of Gilroy Hecker Pass Specific Plan (City of Gilroy 2005).

- Protect occupied habitat for foothill yellow-legged frog in upper Llagas Creek.
- Protect and enhance serpentine grassland and serpentine chaparral (LAND-G1, LAND-C2).
- Protect stands of northern coastal scrub/Diablan sage scrub (LAND-C3).
- Protect and enhance breeding habitat for California red-legged frog and California tiger salamander in the Santa Cruz Mountains (LAND-WP1a, LAND-WP1b, LAND-WP2a, LAND-WP2b).
- Protect riparian habitat along upper Llagas Creek for least Bell's vireo and other native songbirds and provide riparian restoration opportunities (LAND-R2).
- Protect potential habitat for Bay checkerspot butterfly (LAND-G3).

Land acquisition in this conservation analysis zone serves multiple purposes. Some of the only known occupied habitat for foothill yellow-legged frog in the Santa Cruz Mountains in the study area is present upstream of Chesbro Reservoir (H.T. Harvey & Associates 1999). The conservation strategy includes stream protection along upper Llagas Creek to protect this habitat and provide opportunities for habitat enhancement, as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program. Furthermore, potential habitat for Bay checkerspot butterfly (Cañada Garcia site) and serpentine covered plants are also found in this conservation analysis zone. Because surveys have not been conducted in this area, the occurrence of serpentine covered species is largely unknown. This conservation analysis zone also supports small patches of serpentine chaparral.

The land acquisition requirements for this conservation analysis zone are listed below.

- Acquire serpentine grassland within the conservation analysis zones as shown in **Table 5-19**.
- Acquired land that will connect with either protected lands around Chesbro Reservoir or the Open Space Authority lands within the analysis zone.
- Acquire at least 1.0 mile of Llagas Creek above Chesbro Dam to protect and enhance habitat for foothill yellow-legged frog, California red-legged frog, and least Bell's vireo.

## **Pacheco-1, 2, 3, 4, 5, and 6**

Conservation analysis zones Pacheco 1–6 encompass the upper and middle reaches of Pacheco Creek and its tributaries (e.g., south and north forks of Pacheco Creek). These conservation analysis zones are characterized by large, remote ranches with grassland, oak woodland, and chaparral at a variety of elevations and terrain. Extensive tracts of riparian woodlands are found in several zones along Pacheco Creek and its major tributaries. These zones are combined for the purposes of the land acquisition strategy because of their

similar land cover types and species habitat, and the overlapping land ownership patterns among the zones. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.

- Protect and enhance riparian woodland, including large stands of sycamore alluvial woodland, along the main stem and tributaries of Pacheco Creek, and provide restoration opportunities in this area (LAND-R2).
- Protect potential breeding habitat for least Bell's vireo (LAND-R5).
- Protect portions of landscape linkage along Pacheco Creek (Linkage 17 in **Table 5-9** and **Figure 5-8**) (LAND-L1).
- Maintain landscape linkages across SR 152 at key undercrossings or gaps in the highway median barrier (Linkage 15 in **Table 5-9** and **Figure 5-8**) for San Joaquin kit fox and other native species.
- Protect and enhance watershed functions in the Coyote and Pacheco Watersheds (LAND-L3).
- Protect movement and potential breeding habitat for San Joaquin kit fox (LAND-G9).
- Protect and enhance extensive stands of annual and potential native grasslands (LAND-G2, LAND-G3) that support or could support California ground squirrels to provide food and shelter for covered and other native species (LAND-G5, LAND-G8).
- Protect strong environmental and elevation gradients (LAND-L2a, LAND-L2b, LAND-L2c, LAND-L2d).
- Protect large stands of northern mixed chaparral (LAND-C1), mixed oak woodland and forest (LAND-OC1), and valley oak woodland (LAND-OC3).
- Protect and enhance breeding and upland habitat for covered amphibians and reptiles (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5, LAND-WP5, LAND-WP6a, LAND-WP6b).

Land acquisition in these conservation analysis zones will protect important stands of riparian woodland and scrub, valley oak woodland, and northern mixed chaparral. Riparian woodland along Pacheco Creek may provide suitable breeding habitat for least Bell's vireo. These lands may also support secluded rock outcrops or large trees overlooking open grassland that would provide suitable nesting sites for golden eagle and other raptors. In addition, the low-elevation annual grassland and some oak woodland types are suitable for movement of San Joaquin kit fox through the study area to known breeding sites at the fringes of the inner Coast Ranges to the east and south of the county. Acquisition of low-slope grassland in this area may also provide suitable breeding habitat for San Joaquin kit fox, although such events are expected to be rare.

Land acquisition in these conservation analysis zones will also protect a landscape linkage within the Diablo Range (Linkage 15) that will benefit several covered and other native species such as San Joaquin kit fox, Tule elk, and mountain lion. Because the threat of development in these zones is low, land

acquisition in these zones is targeted, in part, at key points along SR 152 where kit fox and other native wildlife are most likely to cross the busy road. SR 152 between Gilroy and the Santa Clara/Merced county line poses a major hazard and a partial barrier to wildlife movement. In addition to the large and increasing volume of traffic, a 6-mile-long median barrier stretches from Bell Station to the Santa Clara/Merced County line. There are only three breaks in this barrier, each about 50 feet wide. Because these breaks are so narrow and few, and because of the high volume of traffic on the road, undercrossings are very important to maintain a landscape linkage across the road.

There are six bridges that span creeks along SR 152 and offer connectivity along the stretch with the median barrier (**Figure 5-8**). The riparian corridors are well vegetated, and the bridge spans offer adequate clearance for all species to move underneath. There are no data of wildlife use of these undercrossings, but the habitat model for San Joaquin kit fox (**Appendix D**) suggests this area as a potential regional linkage. The land acquisition strategy in these zones will preserve key undercrossings along SR 152. The conservation strategy also includes actions to assess and improve wildlife connectivity in these conservation analysis zones; see Section 5.3.2 *Landscape Conservation and Management* subheading *Connectivity and Permeability*.

The land acquisition requirements for these conservation analysis zones are listed below.

- Land acquisitions in these conservation analysis zones will occur as shown in **Table 5-18**.
- Land will be acquired on either side of SR 152 at two key crossing points to protect and provide opportunities to enhance wildlife movement across the road.
- Protect at least 1.0 mile of the main stem of Pacheco Creek, North Fork of Pacheco Creek below Pacheco Dam, or South Fork Pacheco Creek.
- Protect land in the Pacheco Creek Watershed giving higher priority to lands with gentler slopes that provide suitable habitat for San Joaquin kit fox.

## **Pacheco-7 and -8, Coyote-2**

Although they are in different watersheds, Pacheco-7, Pacheco-8, and Coyote-2 serve a similar function because they represent the closest connection between Henry W. Coe State Park and the extensive wetland complex across the county line in San Benito County (San Felipe and Soap Lakes). These conservation analysis zones are also combined for the purposes of the land acquisition strategy because of their similar patterns of land ownership and parcel configuration. The primary purposes of the land acquisition strategy in these conservation analysis zones are listed below.

- Link Henry W. Coe State Park with the San Felipe Lake (Soap Lake) region in San Benito County (Linkage 14 in **Table 5-9** and **Figure 5-8**) (LAND-L6).

- Protect immediate watershed of San Felipe Lake.
- Protect riparian woodland and streams in upper Coyote Creek and Pacheco Creek (LAND-L1, LAND-R2), including large stands of sycamore alluvial woodland.
- Protect freshwater perennial marsh (LAND-WP1a, LAND-WP1b).
- Protect and enhance high density of ponds to support covered amphibians and reptiles and other native species, and possibly tricolored blackbird (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5, LAND-WP5, WP3a, LAND-WP3b, LAND-WP5, LAND-WP6a, LAND-WP6b).
- Protect designated critical habitat for California tiger salamander.
- Protect movement and potential breeding habitat for San Joaquin kit fox (LAND-G9).
- Protect and enhance annual grasslands (LAND-G2) that support or could support California ground squirrels to provide food and shelter for covered and other native species (LAND-G5, LAND-G8).
- Protect foraging habitat for birds using the large wetland complex surrounding San Felipe Lake, including tricolored blackbird.
- Protect strong environmental gradients in the study area (LAND-L2a, LAND-L2b, LAND-L2c, LAND-L2d).
- Protect and enhance valley oak woodland (LAND-OC3).

The land acquisition strategy in these conservation analysis zones focuses on protection of environmental gradients, habitat for covered amphibians, and an important landscape linkage. This area has an unusually high density of ponds compared to the rest of the study area; accordingly, it provides excellent potential breeding sites for California red-legged frog, California tiger salamander, western pond turtle, and possibly tricolored blackbird. With enhancement, this dense network of ponds could support a large population of these covered species. These conservation analysis zones, particularly Pacheco-8, also provide an important connection over a wide range of environmental gradients between Henry W. Coe State Park and the large wetland complex in Soap Lake, including San Felipe Lake. Land within Pacheco-8 provides the most direct connection between this wetland complex and the vast area of annual grassland and oak woodland in the Diablo Range foothills; consequently, Pacheco-8 may be important for terrestrial wildlife moving from the Santa Clara Valley to the Diablo Range. In addition, aquatic species breeding at San Felipe Lake (e.g., tricolored blackbird) likely forage in upland habitats nearby; land within these conservation analysis zones provides the closest upland foraging habitat to San Felipe Lake. This area also provides the “gateway” from the Diablo Range to Linkage 18 along the Pajaro River. Large stands of valley oak woodland and riparian sycamore alluvial woodland are also found within these conservation analysis zones.

The land acquisition requirements for these conservation analysis zones are listed below.

- Land acquisitions in these conservation analysis zones will occur as shown in **Table 5-18**.
- Protect land that connects Henry W. Coe State Park to SR 152 (and San Felipe Lake in adjacent San Benito County).
- Protect at least 1.0 mile of the main stem of Pacheco Creek.

## Conservation Analysis Zones without Requirements

There are no specific land acquisition requirements in the following conservation analysis zones.

- San Tomas-1. This zone is highly urbanized at the western edge of the study area, entirely within San José. There is almost no natural vegetation left in this zone, and the creeks running through it do not provide habitat for any of the covered species.
- Guadalupe-2. This zone is also highly urbanized (84%) and provides only small, fragmented habitat for the covered species. Much of what remains is already in open space designations.
- Coyote-1 and 3. These remote and rugged conservation analysis zones are adjacent to the north and west side of Henry W. Coe State Park. There are limited acquisition opportunities in the zone due to the low number of large parcels. Development potential in this zone is very low due to steep topography, little or no access, and a lack of surface water. The few parcels occurring in these zones are expected to be acquired by State Parks as part of the expansion of Henry W. Coe State Park. Because State Parks is not a permittee in this Plan, land acquisition targets were not established in these zones.
- Coyote-8, 9, and 10. These conservation analysis zones have a relatively high degree of parcelization and urban and rural development, making conservation in these zones challenging. Coyote-10 is almost entirely within the urban service area for San José and is highly urbanized. Coyote-8 and 9 have limited conservation opportunities because of the high degree of rural development. Land acquisition or long-term management agreements within Coyote-10 (and possibly Coyote-8 and 9) will occur to protect and enhance breeding habitat for western burrowing owl consistent with the burrowing owl conservation strategy described in Section 5.4.6 *Western Burrowing Owl*.
- Llagas-1 and 5. These zones are small (Llagas-1 = 3,092 acres; Llagas-5 = 4,129 acres), support only small amounts of high-priority land cover types, and have a high proportion of small parcel sizes, making land acquisition in these zones inefficient.

- Uvas-3 and 4. Similar to Llagas-1 and 5, these zones are small (Uvas-3 = 5,061 acres; Uvas-4 = 4,422 acres). They support only small amounts of high-priority land cover types.

Despite the lack of specific land acquisition requirements in these zones, there are still portions of some of these zones that can contribute to the goals of the Plan. Any land acquired within zones Coyote-3, Coyote-8, or Coyote-9 will count towards the overall land cover requirements for the study area (**Table 5-11**). Acquisition of streams in Coyote-10 may also count towards overall stream acquisition requirements and acquisition of habitat for western burrowing owl in this zone will contribute to goals for this species.

## Acquisition of Habitat for Covered Wildlife Species

The land acquisition requirements for land cover types, by geographic locations (e.g., by Conservation Analysis Zones), and for landscape linkages, combined with the reserve assembly principles will allow the Implementing Entity to create a Reserve System that will conserve the covered species. This will occur through preservation, management, and enhancement, and in some cases, restoration, of suitable habitat for the covered species. Although the Plan is not based on field verification of suitable habitat, we have inferred the location of suitable habitat through a combination of the species models (**Appendix D**), locations of designated critical habitat (for some species), extensive data on species observations, and the expert opinion of field biologists familiar with the covered species and the study area. As a result, we are confident that the Reserve System as designed will adequately conserve the covered species.

Requirements to permanently protect plant occurrences will ensure that the covered plants will be conserved by the Plan. The Wildlife Agencies require additional assurances to guarantee that the Implementing Entity will protect habitat for the covered wildlife species and not just land cover types that are assumed to support their habitat. Furthermore, assurances are needed that the Reserve System will support habitat that is occupied by the covered wildlife species. The following requirements are included in the Plan to address these regulatory needs. All of the additional requirements below are additive to the other land acquisition requirements in the Plan.

## Acquisition of Modeled Habitat for Covered Species

To address the need to acquire habitat for the covered species and not just land cover types, the Implementing Entity will acquire land with modeled habitat for each covered species for which models were developed in the minimum amounts specified in **Table 5-17**. Commitments are provided both for new land acquired for the Reserve System and land incorporated into the Reserve System from existing open space. The commitments are to acquire minimum amounts of *modeled habitat* based on the species models in **Appendix D**.



Species models will be updated during implementation based on new information. Modeled habitat requirements will be tracked based on the most recent model update. The Implementing Entity will be conducting field inventories of new reserve lands to locate, quantify, and assess the quality of suitable habitat for all covered species. The results of this inventory are important for habitat and land acquisition requirement tracking and long-term management and monitoring (see Chapter 7).

## **Acquisition of Occupied Habitat for Select Wildlife Species**

The Wildlife Agencies require additional assurances that land will be acquired for the Reserve System that will support occupied habitat for five covered wildlife species:

- Bay checkerspot butterfly,
- California red-legged frog,
- California tiger salamander,
- Western pond turtle, and
- Foothill yellow-legged frog.

These species were selected because they are known to consistently breed in multiple locations in the study area or because they are so rare that it is necessary to be assured that occupied lands are protected. It is critical that the Reserve System protect some of this occupied habitat to ensure the conservation of the species in the study area.

Occupancy requirements for the purposes of this Plan do not need to be met at the time of land acquisition. This flexibility provides the opportunity to acquire unoccupied habitat that is later occupied as a result of improved management, habitat restoration (e.g., streams), or habitat creation (e.g., ponds) (see Chapter 5, Section 5.2.3 *Reserve System* and Chapter 8, Section 8.2.5 *Wildlife Agencies*). The metapopulation dynamics of the Bay checkerspot butterfly warranted a specific temporal component of the occupancy requirements, which are described in detail below.

It is important to note that these occupancy requirements are designed to aid the Wildlife Agencies in making their regulatory findings. The Implementing Entity will provide habitat management, habitat enhancement, habitat restoration, and/or habitat creation, in addition to these basic occupancy requirements, because these requirements are not the minimum species targets for the Reserve System. To meet the biological goals and objectives for these species (and all covered species), the Plan includes additional restoration/creation, and monitoring beyond those noted in the following basic occupancy requirements. The abundance and condition of the covered species in the Reserve System will be monitored to determine the effectiveness of the conservation actions.

### Bay Checkerspot Butterfly

For the Bay checkerspot butterfly, occupancy will be demonstrated in both core and satellite habitat units (see **Table 5-7** and the species account in **Appendix D** for definitions of core and satellite habitat units). The occupancy requirement will be met by demonstrating the presence of larvae and adults (not just adults, in case individuals fly through a site but are not reproducing).

The Implementing Entity will acquire and manage enough habitat for Bay checkerspot butterfly to ensure occupancy of each of the four core habitat units identified in Figure 5-A of the 1998 Serpentine Recovery Plan (Kirby, Metcalf, San Felipe, and Silver Creek Hills). Occupancy in these four core habitat units must be demonstrated at least four out of every 10 consecutive years of the permit term. This occurrence frequency is based on population data reported for the Kirby, Metcalf, and Silver Creek core habitat units, which are fairly robust (e.g., Kirby population data dates back to 1991).

The Implementing Entity will also acquire and manage land to ensure occupancy of at least three of the six (50%) satellite habitat units identified in the 1998 Serpentine Recovery Plan (W. Hills of Santa Clara Valley, Tulare Hill, Santa Teresa Hills, Calero, Communication Hill<sup>17</sup>, or North of Llagas Avenue) (**Table 5-7**) by Year 45. Occupancy is less certain in satellite habitat units because of their smaller size than and greater distance from core habitat units. Because of their isolation, they are colonized only periodically by long-distance dispersal events. Because of their small size, populations that become established go extinct quickly due to small population sizes (Harrison et al. 1988). For these reasons, occupancy of a total of 50% of satellite habitat units must only be demonstrated once by Year 45. For example, occupancy of Tulare Hill in Year 5, North of Llagas Avenue in Year 10, and Calero in Year 15 would fulfill the satellite component of the occupancy criteria. The satellite units with the greatest chance of occupancy due to size, proximity to core units, and expected improvements in habitat management are:

- Santa Teresa Hills
- Tulare Hill
- Calero

There is a potential that less than 50% of the satellite populations will be occupied by Year 45. If this occurs, the Implementing Entity will remain in compliance with the satellite occupancy criteria if it demonstrates to the Wildlife Agencies that it has managed satellites incorporated in the Reserve System in accordance with the Plan and Bay checkerspot butterfly has not colonized these sites for reasons beyond its control (e.g., climate change).

<sup>17</sup> Communication Hill is considered a historic/unoccupied site. Therefore, the three occupied satellite units could occur in any of the five remaining satellite units that are described by this Plan as occupied, potential, or occupancy unknown.

### **California Red-legged Frog, California Tiger Salamander, and Western Pond Turtle**

California red-legged frog, California tiger salamander, and western pond turtle have been grouped for the purposes of the species occupancy requirement because of their co-reliance and frequent co-occurrence in ponds and perennial wetlands in the study area. To simplify this requirement, the species occupancy requirement for these three species is defined as a minimum percent occupancy of the number of freshwater wetlands and ponds in the Reserve System (not wetland or pond acreage).

- California red-legged frog = 40% of ponds and wetlands in each of the federal Recovery Units 4 and 6 in the Reserve System (which correspond to the two major watersheds in the study area).
- California tiger salamander = 30% of ponds and wetlands in the entire Reserve System.
- Western pond turtle = 25% of ponds and wetlands in the entire Reserve System.

The occupancy requirements for these species must be demonstrated when the Reserve System is fully acquired, which will be at or before Year 45. Occupancy is demonstrated the first time that a pond or wetland is occupied by the species, as defined above. Once occupied, a pond or wetland is counted as occupied for this requirement for the rest of the permit term, even if it becomes unoccupied later<sup>18</sup>. As is the case for all covered species habitat, habitat for these species contained within the Reserve System will be protected, enhanced, restored, and monitored. As such, once presence is documented, there is a high probability that these species will persist within the Reserve System.

To ensure that the Implementing Entity is making progress towards these requirements during the permit term, these occupancy requirements must also be met for the Reserve System at Year 30, minus 5% for each one (i.e., 35% for California red-legged frog, 25% for California tiger salamander, and 20% for western pond turtle). The measurement will be made based on the total Reserve System at Year 30.

For the frog and salamander, an entire wetland or pond is considered occupied if the species is reproducing successfully, which is defined as evidence of metamorphosis. This metric ensures that ponds have the correct hydroperiod to support the full life-cycle of California red-legged frog and California tiger salamanders. A site is considered occupied by western pond turtle if basking is observed by adults and juveniles at the same site. Observations of juveniles and adults provide evidence of successful reproduction, and therefore is an indication of population viability. The presence of multiple age-classes is important given that adult turtle populations can persist in highly modified environments

<sup>18</sup> If a pond or wetland becomes unoccupied later, the Implementing Entity will consider altering management at that site to encourage recolonization through the adaptive management process, but that outcome will not affect the occupancy requirement for that site. See Chapter 7 for more details on the monitoring and adaptive management program.

providing the illusion that the population is stable when in fact reproduction is unable to take place, likely due to degraded upland nesting habitat (**Appendix D**).

Ponds created or wetlands restored in the Reserve System that meet the occupancy criteria will count towards the occupancy requirement. Although unoccupied created ponds or restored wetlands would not contribute to the occupancy requirements of this Plan, they would be credited toward the aquatic land cover requirements described in **Table 5-12**. In other words, these created and restored sites do not count as part of the total ponds and wetlands assessed in the Reserve System for this requirement, if these sites are unoccupied. This approach creates an incentive to create ponds and restore wetlands that are occupied by one or more of the covered species.

The occupancy requirements were derived from three data sources, East Bay Regional Park District (Bobzien and DiDonato 2007), and the Central Valley of California (Germano and Bury 2001). Henry W. Coe State Park has the largest data set in the study area on ponds and wetlands and their occupancy by these three species. Surveys of 136 ponds and wetlands were conducted from 2001–2007 in the park (Belli 2007), most of which were in the study area (the remaining sites were just outside the study area in Santa Clara and Stanislaus Counties). The land cover types in Henry W. Coe State Park are similar to those in the rest of the study area. However, there is less grassland in the park than in the rest of the study area because of its higher elevation.

East Bay Regional Park District conducted surveys of 271 ponds 1996, 2000, and 2004. All ponds were surveyed at least once and many ponds were surveyed more than once (Bobzien and DiDonato 2007). Although not in the study area, the habitats, landscapes, and topography of the park lands within the East Bay Regional Park system are similar to that of the study area. The survey in the Central Valley of California was conducted in 1999 at 55 aquatic sites in the Sacramento and San Joaquin Valleys; 27 of these sites were ponds or lakes (Germano and Bury 2001). Only the data from ponds and lakes was considered for this analysis.

Surveys in Henry W. Coe State Park found California red-legged frog in 41 ponds (30.1%), California tiger salamander in 9 ponds (6.7%), and western pond turtle in 18 ponds (13.2%). The ponds and wetlands in Henry W. Coe State Park are representative of the ponds and wetlands expected to be found in the Reserve System, with two exceptions. First, Henry Coe is at higher elevations than the expected Reserve System. This means that California tiger salamander will likely be more common in the Reserve System than in Henry Coe, all else being equal. Second, there is no active predator removal program in Henry W. Coe State Park to remove bullfrogs, bass, and other nonnative predators. Therefore, California red-legged frog and California tiger salamander are expected to be more abundant in the Reserve System than in Henry W. Coe State Park due to the aggressive predator control planned for the Reserve System.

Surveys of ponds in the East Bay Regional Park District system found California red-legged frog in 75 of 271 ponds (27.7%) and California tiger salamander in 75

of 170 ponds within the range of that species (44.1%) (Bobzien and DiDonato 2007). Western pond turtle occurrences were not reported. The East Bay Regional Park District has an active predator-control program in ponds and other wetlands. Therefore, the abundance of the two amphibians within their ponds is likely more representative of what the Reserve System should expect, with one exception. California tiger salamander distribution within the East Bay Regional Park District may be higher than what will be seen in the Reserve System because the Reserve System will include ponds and wetlands in the Santa Cruz Mountains (not just the Diablo Range, where the East Bay Regional Park District is found). California tiger salamander is likely less abundant in the Santa Cruz Mountains than in the Diablo Range.

The aquatic surveys of the Central Valley ponds and lakes found western pond turtle at 10 of the 27 ponds and lakes surveyed (37%). Amphibians were not surveyed. In this study, sites were selected based on known historic or suspected occurrences of western pond turtle (Germano and Bury 2001). Therefore, the sample was likely biased towards occupied sites and may overestimate the occurrence of this species in all ponds and lakes in the Central Valley.

The species occupancy target for California red-legged frog (40%) was set for the study area as a rounded number greater than the results of these two applicable studies, considering the factors outlined above. The minimum occupancy targets for California tiger salamander and western pond turtle (30% and 25% respectively) were set at or above the midpoint between the two applicable study results. In all three cases, targets take into account the assumed success in attracting these species to created ponds. Nonnative barred tiger salamander alleles will be assumed present in wetlands and ponds containing paedomorphic tiger salamanders<sup>19</sup>; therefore, such ponds and wetlands will not count towards the California tiger salamander species occupancy requirement (see **Appendix K** for details).

Species occupancy for California red-legged frog must be met equally in both of the major watersheds in the study area, which match the two federal recovery units identified in Figure 5-B of the Species Recovery Plan (Units 4 and 6; U.S. Fish and Wildlife Service 2002). In other words, 40% of the ponds and/or wetlands in the Coyote Creek/Guadalupe River portion of the Reserve System will be occupied and 40% of the ponds and/or wetlands in the Pajaro River watershed portion of the Reserve System will be occupied.

Both California red-legged frog and western pond turtle also occur in streams throughout the study area. However, accounting for occupancy in streams, which do not have discrete boundaries as do ponds and wetlands, will complicate compliance monitoring. Furthermore, both species are known to travel significant distances from breeding sites, which would make it more difficult to identify the extent of “occupied” stream length. For these reasons, and because the majority of the conservation benefits afforded to these two species will be

<sup>19</sup> Paedomorphic tiger salamanders are sexually mature adult tiger salamander that retain juvenile characteristics (e.g., maintain larval form). Paedomorphosis is a characteristic of non-native barred tiger salamanders, whereas, California tiger salamanders always metamorphose prior to sexual maturity.

through the preservation and enhancement, restoration, and/or creation of ponds and wetlands (**Table 5-12**), occupancy requirements will be measured by pond and wetland habitat within the Reserve System, not streams.

The species occupancy target for western pond turtle is based on the best available data and the need to meet the regulatory standard to contribute to recovery. If future monitoring data or other information suggests that this target is biologically unattainable, the Implementing Entity will confer with the Wildlife Agencies to revise the target (including how it is measured) to better meet the regulatory standards and the biological goals and objectives of this Plan. Additional conservation actions (e.g., translocation) may be necessary to achieve conservation for this species. All translocation activities will be reviewed and approved by the Wildlife Agencies in advance of translocation activities occurring.

### **Foothill Yellow-legged Frog**

Foothill yellow-legged frog is known or suspected to occur in at least five major rivers and creeks in the study area based on occurrence records and the presence of suitable habitat:

- Upper Penitencia Creek, below Cherry Flat Reservoir
- San Felipe Creek
- Upper Coyote Creek and its tributaries, above Coyote Reservoir
- Llagas Creek above Chesbro Reservoir
- Upper tributaries to Uvas Creek, including Little Arthur and Bodfish Creeks

Additional populations may be present in the many unsurveyed streams of the study area. The population in Upper Coyote Creek is located in Henry W. Coe State Park and the Palassou Ridge Open Space Preserve. The populations in Upper Penitencia Creek and San Felipe Creek are partially contained in Alum Rock Park and the San Felipe Ranch Conservation Easement, respectively. Known populations occur in three of the major watersheds in the study area shown in **Figure 3-6** (Coyote, Llagas, and Uvas). Additional populations may occur in two more watersheds (Pacheco and Pescadero).

For the purposes of demonstrating occupancy of foothill yellow-legged frog in this Plan, occupied habitat within the Reserve System is defined as perennial streams with an observation of egg masses by Year 45. Although there are some reports of foothill yellow-legged frogs breeding in perennial tributaries in the study area, the species typically breeds in perennial portions of main-stem channels (E. Gonsolin pers. comm.; Kupferberg et al. 2009). This is likely because main stem channels provide habitat that is more conducive to successful breeding in the study area (i.e., areas of shallow, low velocity flows during the spring months) as opposed to perennial portions of tributaries that often have turbulent conditions (E. Gonsolin pers. comm.). The presence of egg masses will adequately demonstrate occupancy because spring breeding and summer tadpole rearing represent critical life stages for this species (Kupferberg et al. 2009).

Foothill yellow-legged frogs are known to travel significant distances and are highly stream dependent (**Appendix D**). For these reasons, correlating occupied stream segments (i.e., miles of stream) to observed egg masses will be difficult. Therefore, the foothill yellow-legged frog occupancy requirement for this Plan will be met when the Implementing Entity protects occupied habitat in the Reserve System in at least four of the watersheds in **Figure 3-6**. This target was set based on the probability of occupancy in the Reserve System in each of the watersheds in **Figure 3-6**: very high in the Reserve System within the Llagas watershed, high in the Coyote watershed, moderate-high in the Uvas watershed, and moderate in the Pacheco and Pescadero watersheds. These rough probabilities were based on the location of known occurrences, highly suitable habitat, and Reserve System acquisitions.

Occupied habitat in the Reserve System must be in both the Diablo Range and in the Santa Cruz Mountains. Historic populations of this species have likely been lost from the Santa Clara Valley floor (H.T. Harvey & Associates 1999), so it is important to protect occupied habitat in both mountain ranges in case there is no connectivity between the two ranges.

Furthermore, occupancy will be demonstrated upstream of dams that present permanent barriers to the species or on streams unaffected by dam operations. Although foothill yellow-legged frogs could occur downstream of dams within the study area, remnant populations are likely to be adversely affected by continued dam operations. Foothill yellow-legged frog populations in regulated rivers are likely at greater risk of extinction by virtue of their low abundance, even before the effects of hydrologic stressors are considered (Kupferberg et al. 2009). For these reasons, the best opportunities for maintaining and increasing foothill yellow-legged frog populations exists upstream of dams, or in streams unaffected by dam operations, and will be the focus of the conservation strategy for this species (e.g., see Goal 16 for this Plan).

## Stay-Ahead Provision and Rough Proportionality

The timing and sequence of reserve assembly relative to impacts of covered activities is critical to the success of the Habitat Plan. Progress toward assembling the Reserve System must *stay ahead* of progress toward total impacts allowed under the permit. This sequence ensures that reserve assembly is keeping pace with development and that the Implementing Entity is making steady progress toward the complete Reserve System.

Such progress toward assembly of the Reserve System is a requirement under the NCCP Act. The NCCP Act requires that implementation of mitigation and conservation actions be “roughly proportional in time and extent to the impact on habitat or covered species authorized under the plan” (California Fish and Game Code Section 2820[b][9]). To meet the requirements of this section, CDFG requires that NCCPs make progress towards the final conservation goals (i.e., the ultimate size and configuration of the Reserve System) in proportion to the impacts of covered activities. The Stay-Ahead provision applies to both preservation/enhancement and restoration commitments in this Plan and is

further described in Chapter 8 (Section 8.6.1 *Stay-Ahead Provision*) addresses this requirement.

If impacts occur more slowly than expected, strict adherence to the Stay-Ahead provision would result in relatively slow growth of the Reserve System initially, followed by a rapid expansion of the Reserve System in order to meet the final acquisition targets. To ensure that the Implementing Entity makes steady progress towards the final land acquisition targets, in Year 20 of implementation, the Implementing Entity will work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System. To ensure that the Implementing Entity makes steady progress towards final restoration/creation goals, interim deadlines are established in **Table 5-14** for each watershed in the study area. Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management* also includes deadlines for riverine acquisition and restoration. The Stay-Ahead provision described above must always be followed.

## Land Acquisition Outside the Permit Area

In order to meet the requirements of this conservation strategy, all land acquisition must occur within the Habitat Plan permit area, including the *Expanded Study Area for Burrowing Owl Conservation*<sup>20</sup> (**Figure 1-2**). Parcels extending beyond the County and/or Habitat Plan permit area could be counted toward land acquisition commitments of this Plan if more than half of the parcel is located within the permit area. For example, land acquisition along the ridgeline of the Santa Cruz Mountains may include some land in Santa Cruz County. If parcels are acquired that include land outside the permit area, land cover types on that parcel will be credited toward applicable Plan requirements as long as less than half the parcel is outside the permit area and the total land area credited outside the permit area is less than 250 acres.

As described in the land acquisition strategy, regional linkages are important to some covered and other native species (**Table 5-9** and **Figure 5-6**). The Implementing Entity is encouraged to partner with other organizations to secure these regional linkages inside and outside the study area. For example, the linkage from the Santa Cruz Mountains to the Gabilan Range will not function unless suitable habitat is present in four counties: Santa Clara, Santa Cruz, Monterey, and San Benito. Securing this linkage will require strong partnerships.

## Conservation in the Study Area beyond Habitat Plan Requirements

The land acquisition requirements above are not designed to provide the blueprint for all conservation in the study area. Open space acquisition will

<sup>20</sup> Land acquisition in the *Expanded Permit Area for Burrowing Owl Conservation* will only be done to satisfy requirements for the burrowing owl conservation strategy, not other species covered under this Plan.



continue separate from the Habitat Plan during and after the permit term, and projects not covered by the Plan will need to implement their own mitigation. However, conservation that occurs separate from this Plan will benefit the Plan and the biological resources of the study area if these acquisitions occur in coordination with the Plan. The following general priorities were developed to help guide conservation that occurs separate from the Habitat Plan. These priorities can also guide conservation actions under the Habitat Plan in the event that separate conservation or other actions prevent land from being acquired under the Habitat Plan in the areas listed above. These priorities build on the Habitat Plan Reserve System to create a larger system of conservation and open space in the study area.

- **Conservation Analysis Zones with High Acquisition Priority.** More land acquired in the conservation analysis zones already designated at a high priority for conservation will strengthen the Reserve System by creating larger, more contiguous conservation areas that are better able to preserve covered species habitat and landscape linkages.
- **Uvas-4, 5, Pescadero-1.** Additional land acquisition in these zones will increase protection in the Uvas and Pescadero watersheds to benefit native fish, California red-legged frog, California tiger salamander, and western pond turtle, among others. Land acquisition in this area could complete Landscape Linkage 13 between Mount Madonna County Park and the Reserve System in the southwestern corner of the study area.
- **Uvas-2 and 3.** Additional land acquisition in these zones will increase watershed protection in the Uvas watershed, protecting water quality and habitat for California red-legged frog, California tiger salamander, and western pond turtle along Uvas Creek, above and below Uvas Reservoir. Land acquisition will also support Landscape Linkage 13 and help to connect Mount Madonna County Park with open space surrounding Uvas Reservoir and the Reserve System to the north.
- **Coyote-9.** Land acquisition in this zone will increase protection of annual grassland and blue oak woodland near Alum Rock Park and the Reserve System in Coyote-7 and Alameda-1. Additional protection in this area will preserve more habitat for California red-legged frog, California tiger salamander, and western pond turtle and create a stronger linkage to outside the study area to the north (Landscape Linkage 4).
- **Coyote Ridge.** While most of Coyote Ridge is targeted for land acquisition (see Coyote-4, 5, and 6), parcels with no or lower-quality habitat for Bay checkerspot butterfly and serpentine covered plants would not be included in the Reserve System. Additional land acquisition in Coyote Ridge, particularly in the northwest, would provide additional covered species habitat and important buffers between the Reserve System and existing urban development.
- **Pacheco Watershed.** Additional land acquisition in the Pacheco watershed would strengthen and expand the Reserve System and could provide better linkages to Henry W. Coe State Park and Pacheco State Park. Although development threats in this watershed are low, increased open space could

provide much greater opportunities for habitat enhancement and long-term monitoring.

- **Uvas-1.** Additional land acquisition in the upper Uvas Creek watershed could expand the existing open space and the Reserve System that protects some of the only stands of knobcone pine woodland in the study area. Additional land acquisition could protect the remaining stands of this land cover type and enhance watershed and water quality protection.

## 5.3.2 Landscape Conservation and Management

This section discusses conservation and management in the permit area at the landscape level. The following sections describe conservation and management guidelines and principles for each natural community. Conservation and management guidelines specific to individual covered species are presented in the discussion of the relevant natural community. Additional conservation and management discussions are also included in the species-specific sections (see Section 5.4 *Benefits of and Additional Conservation Actions for Covered Species*).

Each section is organized as shown below.

- **Biological Goals and Objectives:** A summary of the biological goals and objectives for that community presented in **Table 5-1b**.
- **Acquisition, Restoration, and Enhancement:** A summary of the acquisition, restoration, and enhancement requirements as they apply to that landscape or natural community, referencing the biologically appropriate conservation action from **Table 5-2a or 5-2b**.
- **Management Techniques and Tools:** Guidelines and specific techniques and tools that are recommended to achieve the biological goals and objectives. This section provides details on the conservation actions in **Table 5-2b**.
- **Threats and Uncertainties:** Describes the uncertainties associated with the conservation actions and external threats that may make their successful application more difficult.

## Biological Goals and Objectives

A primary goal of this Plan is to protect and maintain natural and semi-natural landscapes within the study area that are large enough to accommodate natural processes beneficial to populations of covered and other native species. The Plan will accomplish this by establishing a Reserve System within the permit area that will preserve a minimum of 33,205 acres (**Table 5-13**). Up to an additional 13,291 acres of existing open space will be incorporated into the Reserve System to enhance their long-term management. The total size of the Reserve System will therefore be a minimum of 46,496 acres.

This Reserve System will support a range of environmental gradients (such as slope, elevation, aspect, rainfall) and a representative diversity of natural communities. In addition to protecting riverine systems and hydrologic function through fee title and conservation easement, the Plan will benefit stream and riparian habitats through the stream setback (described in Chapter 6, Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks*) and by implementing stream and riparian restoration projects.

The Reserve System will be assembled to reduce habitat fragmentation and to sustain and enhance the effective movement and genetic exchange of native organisms within and between natural communities. Habitat connectivity and important movement and dispersal routes will be protected and, when necessary, enhanced inside the study area. Further, the Implementing Entity will increase the permeability for species movement in targeted areas.

The Plan will also enhance or restore representative natural and semi-natural landscapes to maintain or increase the diversity and distribution of native species. Enhancement and restoration activities within the Reserve System will increase the total area of high-quality habitat for covered and other native species and promote those natural processes that define each natural community (e.g., succession, competition). The Reserve System will be large enough to accommodate management for conflicting life history requirements between species. The Reserve System will also be large enough to allow natural disturbance regimes such as fire and flooding to occur. When these natural disturbances cannot be allowed, other management actions will be implemented that mimic those disturbances and yield similar results. Finally, the Plan will eradicate, where possible, or at least reduce the cover, biomass, and distribution of target nonnative invasive plants and reduce the number and distribution of nonnative invasive animals within the Reserve System.

## Acquisition, Restoration, Enhancement, Creation

### Acquisition

During the course of Plan implementation, a minimum of 33,205 acres of natural land cover types will be acquired through fee title or conservation easement to create the Reserve System (**Table 5-13**).

This Plan does not require protection of agriculture land cover types, although the Implementing Entity may acquire and manage agricultural lands if it determines such acquisition would support the goals and objectives of the Plan. All else being equal, the Implementing Entity will acquire parcels with natural land cover types over cultivate agriculture to fulfill the goals and objectives of this Plan.

## Enhancement and Restoration of Natural Communities

All land and aquatic habitats in the Reserve System, including streams, will be enhanced to benefit covered and other native species as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program (LM-6, LM-7a, LM-7b). Existing open space included in the Reserve System would add up to 13,291 acres of natural land cover that would also be enhanced (**Table 5-5**). In total, the Reserve System would encompass 46,496 acres to 46,920 acres.

A required compensation ratio for specific land cover types, plus a minimum compensation requirement regardless of the level of impact, will result in restoration or creation of an estimated 339 acres of riparian forest and scrub, 75 acres of wetland, 72 acres of pond and 10.4 miles of streams in the Reserve System if all anticipated impacts occur (LM-6, LM-7a, LM-7b; see sections below on each land cover type for further information) (**Table 5-13**). The minimum compensation requirement will allow the Plan to contribute to the recovery of these resources within the study area during the permit term.

Restoration and enhancement of natural communities involves the recovery of ecosystem function that has been lost or degraded, respectively. Implementation of restoration or enhancement activities will initiate or accelerate ecosystem recovery with respect to functional processes, species composition, and community structure. Typically, the aim of restoration and enhancement is to return an ecosystem to a historic state or within the bound of its historic trajectory. In other words, the goal would be to recreate an ecological state that existed prior to the degradation of the system (Clewett et al. 2005). However, the level of restoration and the final result of these activities will be constrained by current conditions and feasibility. For the purposes of this Plan, restoration and enhancement activities will be guided by the biological goals and objectives of the Plan, with the overarching goal of enhancing ecological values in protected landscapes.

There are generally four broad steps to determine a restoration or enhancement program (Hobbs and Norton 1996).

- Identify the processes that have led to or are leading to degradation.
- Develop methods to slow or reverse the decline.
- Determine realistic goals and clear measures of success.
- Develop techniques for implementing these goals.

In this Plan, the techniques for enhancement and restoration are articulated as conservation actions and are summarized in each natural community section below. Guidelines are also presented in each section, where applicable, for selecting restoration sites. However, the following broad recommendations apply to all restoration activities.

- **Manage at multiple levels.** Biological processes occur at a wide variety of scales across the landscape. Restoration and enhancement activities will

therefore be planned and executed with these multiple levels in mind. For example, the enhancement of covered plant occurrences will likely occur at a relatively small species level due to the small size of many occurrences. Microhabitats for covered plants such as soil texture, soil depth, rockiness, and nearest neighbor plants will be considered. However, other processes operating at larger levels—such as the spread of invasive species, hillside erosion or deposition, and the patterns of wildfires—will also affect plant habitat enhancement. To be successful, management actions will consider and anticipate processes operating at multiple levels.

- **Balance conflicting species needs.** The effects of an enhancement or restoration action must be evaluated for all covered species before management decisions are finalized. For instance, grazing generally benefits Bay checkerspot butterfly and many of the covered plant species. In contrast, Mt. Hamilton thistle may require grazing exclusions to prevent livestock from trampling its habitat. Similarly, some pond-dependent covered species can require conflicting habitat conditions. Dense emergent vegetation around pond margins can provide good habitat for tricolored blackbird and California red-legged frog but may not provide adequate habitat for California tiger salamander or western pond turtle. The large size of the Reserve System will allow disparate actions to occur in different places and benefit all of the covered species.
- **Account for inherent variability.** It is important to acknowledge that chance events can often exert strong effects on species and natural systems. The most common of these chance events are weather-related factors such as rainfall, temperature, timing of seasons, drought, and the unknown ramifications of global climate change. Other chance events are associated with species populations themselves; these may include reproductive success and dispersal. Such inherently uncontrollable variables and their effects on covered species are best offset by maintaining within the Reserve System a variety of microsites, environmental gradients, and management treatments. This ensures that covered species can take advantage of suitable habitat during good seasons and find refugia in bad seasons.
- **Mimic natural processes.** This is a management technique that recognizes that natural processes (e.g., hydrologic regimes, wildfire) are the fundamental forces that shape natural systems and create and maintain habitat for covered species. Therefore, management actions will focus on defining, maintaining or restoring and, as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, enhancing these natural processes. If not feasible, then the effects of those processes can be duplicated by alternative management actions.
- **Use adaptive management principles.** Flexibility and adaptation will be embraced in making management decisions and improving restoration and enhancement activities within natural communities. Adaptive management principles (described in Chapter 7) will apply across the range of general principles as well as to the specific management techniques and tools described below.

## Management Techniques and Tools

Most management techniques and tools are discussed under each natural community. Some techniques, however, apply to several natural communities or to the Reserve System as a whole. These landscape-level management actions are described below.

### Connectivity and Permeability

One important measure of the Reserve System's success will be the degree to which it allows native wildlife species to move freely within and between the reserve units and to other habitat outside the Reserve System. In addition to wildlife, it is also important that plant occurrences be able to disperse with minimal limitations in order to facilitate occurrence expansion and ensure long-time viability within the context of global climate change. To achieve this, the permeability and connectivity of the study area will be increased by the actions listed below. In landscape ecology, connectivity refers to corridors between core habitat patches that allow for species movement. Protecting species habitat between two existing large protected areas of species habitat to link the two areas is an example of increasing landscape connectivity. Permeability, on the other hand, refers to the relative potential for a species to move across a landscape (Singleton et al. 2002). For example, removal of a fence or other barriers to species movement would increase landscape permeability. While these measures are targeted toward wildlife movement, it is assumed that they will also enhance opportunities for plant dispersal and occurrence expansion.

- Retrofitting or removing fences that serve as barriers or hazards to wildlife movement.
- Improving culverts and other crossing points under roads to make them more attractive and safer for wildlife.
- Perforating or modifying median barriers within the constraints of public safety to make road crossings more available in locations safe for wildlife.
- Collecting consistent data on wildlife movement throughout the study area to better inform the location and type of structures to facilitate movement.

Most fences in the Reserve System will remain and will be utilized for grazing management. Those that are unnecessary will be removed to increase the continuity of the Reserve System (LM-1). Additional fences may be installed to increase flexibility in grazing management or to exclude feral pigs from sensitive natural communities. Most existing private roads within the Reserve System will be utilized for management or monitoring purposes, but those that are unnecessary will be removed and decommissioned (i.e., returned to a natural condition) or stabilized and abandoned both to reduce hazards to wildlife and to reduce the erosion potential associated with dirt and gravel roads. Additional roads may be added to access parts of the Reserve System for management or monitoring purposes. These access routes will conform to the natural contours of

the surrounding landscape and will only be maintained to the extent necessary for access and to reduce the spread of nonnative plant species.

In general, roadways can be made safer for wildlife and for motorists by increasing the number and quality of opportunities for animals to cross them. Median barriers pose a serious hazard to wildlife; when animals try to cross such roads, they often become trapped at the barrier. Median barriers on several major roadways in the study area (e.g., SR 152, Monterey Road) prevent wildlife from crossing except at limited undercrossings. Strategically perforating these medians will both increase the safety of the roadways and increase the connectivity of the study area (LM-5) (see Chapter 6, Condition 6 *Design and Construction Requirements for Covered Transportation Projects*).

Culverts that create a one-way barrier<sup>21</sup> along waterways will be removed or retrofitted to allow movement of fish and aquatic amphibians both upstream and downstream (LM-2). In most cases, retrofitting involves replacing small obstructive culverts with larger, straight culverts to allow species to move through more readily. In some instances culverts may be replaced with clear-span bridges to increase the habitat quality of the waterway where it flows under the roadway (LM-3). This approach enhances the habitat (both aquatic and terrestrial) under the roadway for animal movement. In addition, existing culverts or bridges may be enhanced to increase wildlife movement through or under these permanent barriers. Fencing could be installed along the roadway to guide wildlife species away from the roadway and through undercrossings (LM-4) (see Chapter 6, Section 6.4.4, subheading *Condition 6 Design and Construction Requirements for Covered Transportation Projects*).

### Areas of Focus

Three primary areas of focus are suggested to improve landscape linkages in the study area using the techniques described above: Tulare Hill to Anderson Reservoir, Pacheco Creek (SR 152), and Pajaro River.

#### Tulare Hill to Anderson Reservoir

The section of valley floor between Tulare Hill and Anderson Reservoir is one of the narrowest points in the Santa Clara Valley. For wildlife moving between the Santa Cruz foothills and the Diablo foothills, this topographic pinch point is the closest connection, limiting the distance traveled across the valley floor (Linkages 6, 8, and 10 in **Table 5-9** and **Figure 5-8**) (see *Coyote-7 and -8* in Section 5.3.1 *Land Acquisition and Restoration Actions*).

U.S. 101 is a major barrier influencing wildlife movement across the valley between Tulare Hill and Anderson Reservoir. At least 24 undercrossings or culverts have been documented by CDFG along this stretch of U.S. 101 (**Figure 5-9a**). Most of the culverts would allow safe passage to many species of wildlife, although some are navigable only by the most agile species (e.g., bobcats). Many species of wildlife (e.g., bobcats, skunks, raccoons) have been

<sup>21</sup> One-way barriers occur when species can move in one direction, but not the other; for example, fish moving downstream but not upstream.

documented using these culverts, and most of the culverts are utilized by multiple species (T. Diamond pers. comm.).

All the culverts that adjoin open space Types 1, 2, and 3 on the west side of the highway provide a connection to the Coyote Creek Parkway. These culverts could be improved to better facilitate wildlife movement into and through the culverts. In addition, measures could be implemented to improve wildlife access to the few bridge underpasses along Coyote Creek. Increasing wildlife access to Coyote Creek will help to maintain this important landscape linkage between the Diablo Range and the Santa Cruz Mountains.

### **Pacheco Creek (SR 152)**

Retaining a habitat linkage within the Diablo Range will benefit several covered and other native species (e.g., San Joaquin kit fox, Tule elk, mountain lion) within the study area. Along the 6 miles of SR 152 there are only three breaks in the highway median barrier, each about 50 feet wide (**Figure 5-9b**). These three breaks provide some opportunities for wildlife to cross the highway, but given the high volume of traffic, the likelihood of wildlife successfully using these breaks is low. Increasing the number and quality of crossing opportunities along this stretch will create connections for wildlife across SR 152.

Conservation options that would increase the permeability of SR 152 are limited. There is the possibility of increasing the function of existing linkages by enhancing the few undercrossings on both sides of the highway (bridges and culverts) to make them more biologically appropriate for wildlife use (see *Pacheco 1–6* in Section 5.3.1 *Land Acquisition and Restoration Actions*).

In order to maximize connectivity in this area, enhancements will be prioritized by focusing on the features shown below in descending order.

- Bridges with naturally vegetated riparian corridors on both sides of the highway.
- Bridges with degraded or otherwise limited riparian corridors on one or both sides of the highway.
- Culverts or other small passageways.

### **Pajaro River**

In addition to providing local and regional habitat linkages to native species such as bobcat, and mountain lion, the Pajaro River riparian corridor supports many covered species within the study area. It also provides connectivity to areas outside the study area—specifically the Gabilan Range and Monterey Bay (Pacific Ocean). The river itself provides movement habitat for native fish and linkages to breeding and rearing habitat in the upper reaches of its tributaries (Linkages 11, 12, and 17 in **Table 5-9 and Figure 5-6**). The riparian corridor associated with the river supports California red-legged frog and likely supports least Bell's vireo, though this species has not been documented along the Pajaro in recent years.



### Monitoring Wildlife Movement

The Implementing Entity will institute a data collection program to better understand how wildlife moves within and through the study area. While the areas listed above will likely be the focus of monitoring efforts, at least initially, this program will help determine linkage and connectivity throughout the study area. It will also help to define the role of the study area in the overall connectivity of the region. The data collected through this effort will be available for design and implementation of covered road projects. This program will remove the burden of data collection from each participating agency and ensure that all the data collected during the permit term is collected and collated consistently, is maintained in a central location, and is accessible. The program is described in Chapter 7, Section 7.3 *Monitoring and Management Actions*.

### Feasibility Study

A feasibility study will be initiated by the Implementing Entity when adequate monitoring data exist on wildlife movement in the three focal areas described above or by year 10 of implementation, whichever comes first (STUDIES-1). The Implementing Entity will commit \$500,000 to fund this study, which will evaluate the following questions for each of the three focal areas.

- Based on existing monitoring data, what feasible engineering options are available, small and large, to improve connectivity for the covered species and for native wildlife in general?
- What is the relative feasibility of these options based on factors such as regulatory permitting, cost, environmental impacts, and land use and safety compatibility?

### Fire Management

In addition to protection by city fire departments, the study area is served by the Santa Clara County Fire Department and Cal Fire. Cal Fire is often the primary responder to wildfires in natural areas<sup>22</sup> (California Department of Forestry and Fire Protection 2005) and will likely be the primary firefighting agency within Reserve System.

Local wildfire responses may not always benefit covered natural communities and species in the Reserve System. Aggressive response to wildfires can damage topsoil or cause excessive erosion, particularly if heavy machinery or chemical treatments are used to create firebreaks or suppress flames. Most of the natural communities in the study area are adapted to fire and respond positively after a burn. Some communities (e.g., chaparral, foothill pine-oak woodland) and species (e.g., Coyote ceanothus) require fire for regeneration and may require some level of burning to continue to persist. However, fire also often threatens human lives and property. These differing perspectives on fire need to be balanced during Plan implementation.

<sup>22</sup> Three battalions in the Santa Clara Unit of Cal Fire serve the study area: Battalion 1 (Morgan Hill), Battalion 2 (San José), and Battalion 7 (South Santa Clara County) (California Department of Forestry and Fire Protection 2005).

Fire management will be a component of each reserve unit management plan developed as the reserve units are acquired and incorporated into the Reserve System. The fire management component will include discussions with Cal Fire and other local fire-fighting agencies on the use of biologically appropriate management response measures for fire events and fire-dependent ecosystems (LM-8). This general fire management component for the Reserve System should be based, in part and as applicable, on agreement between USFWS, CDFG, and the U.S. Forest Service on fire-fighting techniques. Fire management will be incorporated into the reserve unit management plans prepared for each reserve unit within 5 years of the first acquisition of the land for the reserve unit. The reserve unit management plans will include a range of fire response, from full suppression when wildfires compromise public safety and personal property, to less than full suppression in predetermined areas of the reserve unit where public safety and personal property is not compromised, and fire-dependent natural communities are present. The plans may include controlled burn and let-burn components. The goal of such components would be to reduce fuel loads and decrease fire intensity while promoting fire-dependent natural community regeneration and a natural successional process where feasible. This approach would protect public safety, personal property, and sensitive natural communities while allowing for persistence of natural processes in fire-dependent natural communities. The reserve unit management plan will also include coordination with other land management agencies regarding allocation of prescribed burn permits from the Bay Area Air Quality Management District (BAAQMD).

The reserve unit management plans will describe minimum impact suppression tactics (also known as MIST<sup>23</sup>). Many plans utilizing these techniques and plans with low-impact rehabilitation (restoration) techniques have been developed in recent years. The goal of minimum impact suppression tactics is to safely suppress wildfire using environmentally sensitive suppression methods. Examples of minimum impact suppression tactics guidelines and actions that will be implemented include the following.

- Give preference to using methods and equipment that have the least adverse environmental effects.
- Give serious consideration to the use of water as a firelining tactic.
- Establish mobilization and demobilization areas to minimize spread of noxious weeds or diseases.
- Consider use of helibucket with water or foam before calling for airtankers and retardant.

In order to assure that the reserve unit management plans are followed during fires, the Implementing Entity will develop a wildfire local operating agreement for the Reserve System with Cal Fire and with any other firefighting agency that has responsibility for Reserve System lands. The operating agreement will ensure that the fire management components are implemented, that minimum

<sup>23</sup> For example, see <[http://www.wildfirelessons.net/documents/GB\\_MIST\\_Guidelines.pdf](http://www.wildfirelessons.net/documents/GB_MIST_Guidelines.pdf)> or the National Wildfire Coordinating Group at [www.nwcg.gov](http://www.nwcg.gov).

impact suppression tactics are utilized, and that post-fire restoration is carried out. An example of a local operating agreement that has been developed and utilized successfully is the Henry W. Coe State Park agreement with Cal Fire (California State Parks 2007). The wildfire local operating agreement will be in place within four years of permit issuance. This will allow time for the fire management component of reserve unit management plans to be developed and for the Implementing Entity to work closely with Cal Fire to develop the operating agreement.

Specifically, the wildfire local operating agreement for the Reserve System will, at a minimum:

- inform the firefighting agencies of Reserve System fire policies and sensitive resources<sup>24</sup>,
- inform the Implementing Entity of functions within the Incident Command System (Cal Fire) with respect to wildland fire,
- be the local working agreement between the Implementing Entity and firefighting agencies for all activities related to wildland fires in the Reserve System,
- designate responsibilities and guidelines for all activities related to wildland fires,
- allow the Implementing Entity to be a Resource Advisor in the Incident Command System in the event of a wildfire,
- identify minimum impact suppression tactics during and after wildland fires to ensure the minimum possible environmental impacts, and
- identify biologically appropriate and complete post-fire restoration and rehabilitation responsibilities.

Following a fire, the Implementing Entity shall initiate remedial measures as described in Chapter 10, Section 10.2.1 *Changed and Unforeseen Circumstances* subheading *Fire*.

To ensure the success of prescribed burns and minimum impact fire suppression techniques described in this Plan, the Implementing Entity will hire staff with expertise in controlled burns and fire fighting using these techniques. Staff with this expertise will also help to ensure clear and frequent communication with Cal Fire, which is essential to proper implementation of these techniques during a wildfire (D. Rocha pers. comm.). Staff with this expertise will also help to ensure immediate assessment and possible responses following detection of wildfires in the Reserve System.

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<sup>24</sup> The Implementing Entity will update the appropriate local firefighting agencies of sensitive resources in the Reserve System as the Reserve System grows.

## Control Invasive Plants

Exotic plants (i.e., nonnative plants) pose a serious threat to ecosystem function, native biological diversity, and many covered plant species. However, many exotic plants cannot be effectively controlled due to their great abundance, high reproduction rate, and proficient dispersal ability; the high cost of control measures; or unacceptable environmental impacts of control measures. Therefore, the focus of control efforts in the Reserve System will be on the most invasive nonnative plants.

The spread of invasive plants may be exacerbated by covered activities. For example, increased human and pet populations can serve as dispersal vectors at the urban-wildland interface or through increased recreation in the Reserve System. Covered roads or other linear facilities can serve as dispersal corridors for these species. Accordingly, an aggressive control program is needed to minimize the adverse impacts of invasive plants and to enhance natural communities. Moreover, improved management within the reserves is expected to increase the resilience of natural communities to invasion by new invasive plants.

The Implementing Entity will address the control of invasive plants as a component of each reserve unit management plan. The appropriate management technique will be selected based on the invasive species present (**Table 5-20**). Control of invasive plants on reserve lands should begin immediately after acquisition if infestations are serious (e.g., yellow star-thistle), even if the reserve unit management plan is not finalized. Efforts to control invasive plants will be evaluated and revised as needed. Formal evaluations and revisions will take place at least every 5 years<sup>25</sup>.

The goals of the each reserve unit management plan will be to control the spread of noxious weeds (as defined by the California Department of Food and Agriculture) and invasive exotic plants listed by the California Invasive Plant Council (California Invasive Plant Council 2007 or latest list) into new areas and to control infestations of noxious and serious weeds. Another important goal will be to distinguish those species for which eradication or control will be the objective and those species that will be addressed through landscape-level management. The major elements listed below will be included in each reserve unit management plan.

- An assessment of the exotic plants likely to be invasive within the reserve unit that includes the following components.
  - Maps and descriptions of their distribution and abundance.
  - Their known or potential effects on ecosystem function, native biological diversity, sensitive natural communities, and covered species.
  - The means and risk of their spread to other areas within and outside the reserves.

<sup>25</sup> This is the approximate interval at which the list of invasive plants in California is updated by the California Invasive Plant Council.

- ❑ The cost, feasibility, and effectiveness of available control measures for each species.
- An assessment of invasive plants not currently found in the reserves but that are found nearby or in similar habitats and that might invade the reserves in the future. The assessment will include a description of known or potential effects on ecosystem function, native biological diversity, sensitive natural communities, and covered species.
- Development and application of criteria for establishing invasive plant control priorities.
- Integration and coordination of exotic plant control efforts in the Reserve System with efforts of other ongoing invasive plant control efforts such as those listed below.
  - ❑ Efforts to reduce the spread of barbed goat grass on Coyote Ridge (conducted by Dr. Stuart Weiss)
  - ❑ Efforts by SCVWD and County Parks to eradicate giant reed from Coyote Creek below Anderson Dam (County of Santa Clara Parks and Recreation Department 2007).
  - ❑ The integrated pest management program for yellow star-thistle in Santa Clara County that has been experimenting with biological control agents (coordinated by the County of Santa Clara Agriculture Commissioner).
  - ❑ Plans by County Parks to control invasive plants in various sites to be added to the Reserve System (conducted by County Parks and various consultants).
- A description of methods to control and prevent the establishment of invasive plants and criteria for evaluating the suitability of application of these methods based on site-specific conditions.
- A description of a process by which future invasive plants can be evaluated quickly to determine the best course of action for their effective removal or control.

Development of the invasive plant component of the reserve unit management plans will be coordinated with the Santa Clara County Division of Agriculture, the Santa Clara County Weed Management Area, and other major resource management agencies in the study area including SCVWD, the Open Space Authority, State Parks, and County Parks. Neighboring land management agencies such as Midpeninsula Regional Open Space District and Peninsula Open Space Trust will also be consulted. Because control of many invasive plants in the study area is a regional issue, coordination with these agencies is essential. Coordination could include sharing costs, staff, and equipment and conducting joint management programs to address the regional problem of invasive plants. Management to control invasive plants will be prioritized such that the invasive plants with the greatest impacts on covered species are addressed first.

## Herbicide Application

The selective use of herbicides is a conservation action proposed to control or eradicate invasive plants that may be used judiciously and occasionally within the Reserve System in specific locations (LM-14). Herbicide application may be necessary in particularly heavy infestations of exotic plants (e.g., Transline herbicide is effective in controlling yellow star-thistle). Certified personnel will conduct any herbicide application. Herbicides will be used with great caution, especially near seeps, creeks, wetlands, and other water resources. Herbicide use will be reserved for instances where no other eradication techniques are found to be effective. SCVWD is currently using this technique, among others, in the implementation of the Stream Maintenance Program within riparian zones (Santa Clara Valley Water District 2010). Herbicide restrictions within the Pajaro River watershed would also be applied, consistent with the guidelines of the Stream Maintenance Program (Santa Clara Valley Water District 2010).

## Control Nonnative Animals

### Bullfrogs and Nonnative Predatory Fish

The Implementing Entity will work to eradicate or reduce nonnative predators (e.g., bullfrogs, nonnative predatory fish) through habitat manipulation (e.g., periodic draining of ponds), trapping, hand capturing, electroshocking, or other control methods. Removal of bullfrogs and nonnative predatory fish will be a high priority in existing ponds or wetlands within the Reserve System (LM-13). The creation of new ponds or restoration of wetlands will only be conducted in areas where there are no known bullfrogs or where bullfrog control programs are underway or can be established.

Newly created ponds will be designed to periodically dry up naturally. In addition, where feasible, all new ponds will have drains installed to allow for occasional draining of the pond to control bullfrogs and nonnative predatory fish in case natural drying does not occur (POND-5). Some existing ponds might be retrofitted with drains if the nonnative species populations cannot be controlled by other means. Existing ponds without drains and that do not drain naturally may need to be drained periodically using pumps. During any maintenance or heightening of stock pond dams to increase capacity, the Implementing Entity-maintained rebuilt structures will be fitted with drains.

Draining ponds, sterilizing or removing subsoil, and removing bullfrogs can be effective at reducing predation by bullfrogs and other invasive species on covered amphibians and reptiles (Doubledee et al. 2003). Drainage of stock ponds and other wetlands will be carried out during the summer or fall dry season. Population models predict that draining ponds every 2 years will increase the likelihood that California red-legged frogs will persist in ponds with bullfrogs (Doubledee et al. 2003). SCVWD will evaluate water inputs from outside the study area to control nonnative fish and other exotic species from entering and establishing populations in waters inside the study area.

The SCVWD routinely distributes local and imported water supplies. Water distribution and release to stream channels may introduce and spread exotic, predatory, competitive, and habitat-altering species. To contain exotic species within off-channel recharge basins, current and future outflow systems will be screened.

### **Feral Pigs**

Feral pig impacts on natural communities are well documented within the study area. In Henry W. Coe State Park, adverse affects were documented on grassland, oak woodland, and aquatic natural communities (Sweitzer and Loggins 2001). Rooting disturbance by feral pigs allows nonnative invasive plants to establish in grassland and aquatic communities, and fall acorn foraging likely has a detrimental effect on oak regeneration (Sweitzer and Van Vuren 2002). An aggressive feral pig control program will be implemented on the Reserve System using trapping, hunting, or other effective control methods (LM-12).

The impact of rooting activities in pond and wetland natural communities may be reduced by fencing, although fencing to exclude feral pigs will need to be built for that purpose and maintained frequently in order to be effective. If fencing is used, it must be constructed so as not to restrict wildlife movement routes or corridors. In cases where livestock access to ponds and surrounding uplands is desired but feral pigs are degrading habitat, a feral pig control program could be initiated to improve pond habitats (POND-6). Feral pig control has been effective on San Francisco Public Utility Commission land in the adjacent Alameda Creek watershed (T. Koopman pers. comm.) and in Henry W. Coe State Park within the study area (Sweitzer and Loggins 2001; program is on-going). Feral pig control will be focused on parts of the permit area where the concentrations of feral pigs are high and impacts on native communities have been observed. It would be difficult to census the exact number of feral pigs within the Reserve System without an extensive effort. However, rooting disturbance can be monitored. Pig populations will be controlled during the permit term as long as their disturbance (i.e., rooting disturbance) adversely affects the Implementing Entity's ability to successfully implement the conservation strategy for this Plan.

### **Public Education and Outreach**

Public education and outreach will be an integral component of reserve management. The Implementing Entity will conduct outreach to local private and public landowners and residents that will include education on the Plan's management goals and objectives as well as implementation techniques. The focus of public education and outreach activities will be to raise landowner and public awareness of reserve management goals, actions and methods, and how the public can support and help implement them. For example, through the public outreach program, the Implementing Entity will obtain input from interested citizens on the preparation and implementation of reserve unit management plans. Activities may include education about

- not planting invasive plant species or releasing invasive animals such as bullfrogs,
- land uses to allow wildlife passage through streams and upland areas, or
- best management practices in agricultural and urban areas to minimize impacts to streams and other sensitive habitats.

The public education and outreach staff of the Implementing Entity will serve as a conduit for technical information and expertise available to landowners and the public. The Implementing Entity will develop and publish guidelines for local landowners and provide education programs to assist in the implementation of such guidelines. Public education and outreach will be coordinated with other local agencies providing similar services in the study area (e.g., County Parks, SCVWD, Open Space Authority).

To support the stream conservation actions (e.g., STREAM-1, STREAM-2, STREAM-3) and the stream and riparian setback condition (Chapter 6, Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks*), the Implementing Entity will develop Stream Management (Riparian Land Use). Guidelines for private landowners, including an educational program to assist in the implementation of the guidelines, within five years of permit issuance. The guidelines and educational program will be based on SCVWD's *Guidelines & Standards for Land Use Near Streams* (Santa Clara Valley Water Resources Protection Collaborative 2006) developed for local permitting agencies, homeowners, and developers. The focus of the program and guidelines will be to raise landowner awareness of riparian conservation actions and methods that can be employed to protect riparian habitats and streams.

## Threats and Uncertainties

Threats to covered species and natural communities at the landscape level include those threats that this Habitat Plan seeks to minimize and offset, such as habitat loss, habitat fragmentation, and other forms of habitat degradation (see Chapter 4). The expected increase in vehicle traffic in the study area during the permit term will increase the threat to species that move across roads. Increases in population and transportation corridors will also increase the risk of the spread of invasive plants subject to the invasive plant component of the reserve unit management plan. Consequently, more invasive plants and exotic wildlife are expected to warrant eradication or control in the future.

While it is important to provide habitat linkages for native fish, wildlife, and plants, it is also important that those linkages do not facilitate an increase in nonnative species within the study area. The implication of management actions on the distribution of nonnative species will be weighed before these actions are implemented. In some cases, increasing habitat connectivity within the study area may introduce nonnative predators to areas that had been insulated from such introduction. For example, installing or improving culverts may increase access by covered amphibians to sites that expose them to new hazards. By creating the Reserve System and applying substantial long-term management and



monitoring through the Plan, some of these threats will be reduced and offset. However, many of these threats will remain outside the Reserve System.

Fire in the Reserve System is both an opportunity and a threat. Wildfires at moderate frequencies can maintain a healthy mosaic of natural communities without the buildup of too much fuel. If fires occur too infrequently, there is the threat that fires will burn too hot, damaging native ecosystems while promoting nonnative vegetation establishment. Fires that are too frequent could have similar effects. A combination of a let-burn policy, prescribed burns where and as needed, and restrictions on human access or uses in areas of the Reserve System with high fire risk should address this threat.

Climate change is one of the largest threats and uncertainties that the Plan confronts in the management of natural landscapes. Creating climate predictions for an area as small as the study area is not possible with current modeling technology and unlikely for an extended time. At the micro-scale, change in temperature, along with precipitation patterns (either wetter or dryer) could adversely affect covered species and natural communities in the Plan area. Accordingly, several ecological responses are possible during the permit term.

- **Phenological changes resulting in phenological mismatches.** Timing of seasonal events, such as migration, flowering, and egg laying, may shift earlier or later (Walther et al. 2002; Forister and Shapiro 2003; Root et al. 2003; Root et al. 2005). Such shifts may affect the timing and synchrony of events that must occur together, such as butterfly emergence and nectar availability.
- **Reduction in species and natural community range and distribution.** Narrowly distributed species and natural communities that already have restricted ranges due to urban growth, altitudinal gradients, or within narrow environmental gradients are particularly vulnerable (e.g., Bay checkerspot butterfly, Mount Hamilton thistle) because they likely have nowhere to move if their habitat becomes less suitable (Parmesan et al. 1999; Pimm 2001; Walther et al. 2002; Easterling et al. 2000; Shainsky and Radosevich 1986; Murphy and Weiss 1992; J. Hillman pers. comm. 2007).
- **Shifts in natural community distribution and composition.** Increases in disturbance events, such as fire or flooding, could increase the distribution of disturbance-dependent land cover type and plant species, such as redwood forest annual grassland, within the study area (Brown and Hebda 1998; Lenihan et al. 2003; Fried et al. 2004; California Climate Change Center 2006; Rogers and Westfall 2007).
- **Changes in species abundance.** The number or density of individuals found in a particular location may change triggered by changes in resource availability associated with an increase or decrease in precipitation (Walther et al. 2002; Lenihan et al. 2003; Millar et al. 2006; Pounds et al. 2006). Changes such as these may benefit one species at the expense of another.

The conservation strategy, reserve design, and monitoring and adaptive management program address the threat of climate change using a multi-level approach: landscape level, natural community level, and species level. This

approach focuses on protecting and enhancing a range of natural communities, habitat types, and environmental gradients (e.g., altitude, aspect, slope), as well as other features that are important, as availability of resources and habitat types in the study area changes with climate change. More details on the effects of climate change to the study area and covered species, and the Plan's anticipation of these effects, are found in **Appendix F**.

### 5.3.3 Grassland Conservation and Management

#### Biological Goals and Objectives

The overarching biological goal for grasslands is to maintain and enhance functional grassland communities that benefit covered species and promote native biodiversity. Specific objectives within the Reserve System entail protection of serpentine grassland, other native grasslands, and other endemic features of the community such as serpentine seeps and serpentine rock outcrops. An additional objective is to ensure that a diversity of soil types and other environmental gradients are acquired in areas suitable for enhancing native species. Grasslands will be enhanced by reducing cover and biomass of nonnative invasive species and by increasing the diversity of native plants. A final objective that will enhance the grassland natural community is to increase distribution of California ground squirrels to increase the prey base and burrow availability for covered species.

Grassland conservation and management is anticipated to benefit 18 covered species. Covered species use of the grassland natural community is varied. Wildlife use includes movement, foraging, breeding, and year-round habitat. The grassland natural community is known to provide primary and secondary habitat for plants. Bay checkerspot butterfly uses serpentine bunchgrass grassland as year-round habitat and may use other grassland types for movement habitat to move between serpentine grassland habitat patches (see Section 5.4.1 *Bay Checkerspot Butterfly*). California tiger salamander and California red-legged frog use grassland for upland and movement habitat (see Section 5.4.2 *California Tiger Salamander* and Section 5.4.3 *California Red-legged Frog*). Western pond turtle uses grassland as movement (see Section 5.4.5 *Western Pond Turtle*). Western burrowing owl uses grassland for foraging and breeding (see Section 5.4.6 *Western Burrowing Owl*). Tricolored blackbird uses grassland as year-round habitat (see Section 5.4.8 *Tricolored Blackbird*). San Joaquin kit fox uses grassland for movement and foraging (see Section 5.4.9 *San Joaquin Kit Fox*).

Serpentine bunchgrass grasslands and serpentine rock outcrop provides primary habitat for Tiburon Indian paintbrush, Santa Clara Valley dudleya, smooth lessingia, and Metcalf Canyon jewelflower (see Section 5.4.10 *Tiburon Indian Paintbrush*, Section 5.4.13 *Santa Clara Valley Dudleya*, Section 5.4.16 *Smooth Lessingia*, and Section 5.4.17 *Metcalf Canyon Jewelflower*). Serpentine bunchgrass grassland provides primary habitat for Coyote ceanothus and fragrant fritillary (see Section 5.4.11 *Coyote Ceanothus* and Section 5.4.14 *Fragrant*

*Fritillary*). Serpentine bunchgrass grassland and serpentine seeps provide primary habitat for Mount Hamilton thistle (see Section 5.4.12 *Mt. Hamilton Thistle*). Finally, serpentine bunchgrass grasslands and serpentine rock outcrops provides primary habitat and non-serpentine rock outcrops provides secondary habitat for most beautiful jewelflower (see Section 5.4.18 *Most Beautiful Jewelflower*). The grassland acquisition and enhancement conservation actions identified in the following sections are intended to benefit these species as well as the natural community.

## Acquisition and Enhancement

The Plan requires that the Implementing Entity acquire at least 17,300 acres of grassland through fee title or conservation easement (**Tables 5-11 and 5-18**).

### Grassland Acquisition

The Implementing Entity will protect, through fee title purchase or easement, at least 4,000 acres of serpentine bunchgrass grassland, 120 acres of serpentine rock outcrops/barrens, 10 acres of serpentine seeps (LAND-G1, **Tables 5-11 and 5-18**), 10 acres of rock outcrops, and 13,300 acres of annual grassland (LAND-G2, **Table 5-11**). Specific acquisition targets are not established for native grasslands because native stands intergrade with nonnative grasses and are generally not well documented or mapped in the study area. Land acquisition will prioritize those parcels with stands of native grasses. Perennial bunchgrass grassland will be prioritized for acquisition where it occurs (LAND-G2). The Implementing Entity will manage these lands as part of the Reserve System. These areas will be representative of the diversity of vegetation alliances, soil types, topography, elevation, and other environmental gradients in the study area.

The Implementing Entity will acquire all land by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that grassland preservation requirements be met prior to impacts occurring to each grassland land cover type, with a 10% allowable deviation.

Acquisition of serpentine grassland will occur primarily on Coyote Ridge from Silver Creek south to Anderson Reservoir. Large stands of serpentine grassland will also be acquired in the Santa Teresa Hills, near Chesbro Reservoir (Llagas-2), and north of Morgan Hill (Coyote-5 and Llagas-3). Land acquisition targets for serpentine grassland that are geographically specific (see **Table 5-19**) will ensure that the most valuable stands are acquired to support the covered species. Portions of several County parks expected to be incorporated into the Reserve System support large and important stands of serpentine grassland that will be managed more effectively: Santa Teresa, Calero, and Coyote Lake-Harvey Bear Ranch (**Table 5-5**).

Annual grassland will be acquired for the Reserve System on and near Coyote Ridge, near San Felipe Creek, in Upper Penitencia Creek watershed, in the Pacheco Creek watershed, north of Gilroy, and in the southwest corner of the study area (Uvas-5, Uvas-6, Pescadero-1). County parks with significant stands of annual grassland that will be incorporated into the Reserve System include Joseph Grant and Coyote Lake-Harvey Bear Ranch (**Table 5-5**).

## **Grassland Enhancement**

All grasslands in the Reserve System will be enhanced. Grassland enhancement will begin immediately after reserve unit management plans are completed or updated for each reserve unit. Native grasslands will be enhanced in the reserves using techniques tailored to the grassland type (i.e., the vegetation alliance) and the site. Each grassland stand will be classified to the alliance level according to the CNDDDB vegetation classification scheme (California Department of Fish and Game 2003).

Enhancement techniques and frequencies and intensities of application will be informed by pre-acquisition assessments, baseline surveys, and targeted studies (see Chapter 7). Grassland communities in the study area are mosaics of many vegetation alliances, as described in Chapter 3, and will occur throughout the Reserve System. The proper management regime necessary to maintain this mosaic of grassland types and enhance each grassland vegetation alliance will be determined through a combination of proven techniques such as moderate livestock grazing and small-scale experimental treatments, or pilot studies. Pilot studies will be initiated on small species levels to determine the feasibility of enhancement activities that, if successful, can be applied on a larger level. The pilot studies will test approaches to promote native grassland species and will be conducted as part of the monitoring and adaptive management program.

If monitoring demonstrates that the treatments are effective at increasing the relative cover of native grasses and forbs, the reserve manager will evaluate whether these treatments can be applied to the entire stand of the grassland vegetation alliance to achieve enhancement objectives of grassland on a larger scale. In some cases, management regimes could be shifted in time, location, or intensity to achieve these objectives. This evaluation must be conducted on a case-by-case basis in which the expected benefits to grassland are weighed against the environmental impact, hazard risk, and increased cost of applying the technique on a larger scale.

## **Management Techniques and Tools**

### **General Principles for Grassland Management**

Enhancing grasslands within Habitat Plan reserves will likely require applying many of the management techniques described below concurrently at different sites and on different scales to create a mosaic of grassland conditions. Applying

different management techniques across different spatial and temporal scales will maximize habitat heterogeneity across the landscape and will tend to increase native biological and structural diversity (Fuhlendorf and Engle 2001). For example, the buildup of dead plant material, or thatch, has been implicated in the suppression of native annual forbs in unmanaged wet grasslands in California (Hayes and Holl 2003). Techniques to reduce thatch (e.g., livestock grazing, prescribed burning, raking) will be applied only where the treatment is expected to benefit native grassland species. Techniques to reduce thatch should be discontinued if they are demonstrated to promote expansion of invasive species or encroachment of nonnative grassland into native grassland areas. These management techniques can also be effective at reducing the overall biomass of nonnative, invasive species and brush and increasing the annual success of native grassland species (LM-11).

Managers must consider the impacts of management treatments on other covered species. For example, if burns occur within grassland habitat, treatments may affect covered plants in both positive and negative ways (Gillespie and Allen 2004); accordingly, it is important to monitor several life stages to determine the net effect of management actions.

Site conditions (both physical and biological) and land use history are important in developing biologically appropriate management techniques to attempt to enhance native grassland alliances (Stromberg and Griffin 1996; Hamilton et al. 2002; Harrison et al. 2003). For example, some species of native grasses may occur primarily on steep north- or east-facing slopes where soil moisture tends to be higher (Jones & Stokes Associates 1989). Management strategies at these sites will differ from sites on more level topography and drier, south-facing slopes.

## Livestock Grazing

The flora of the study area evolved under the influence of prehistoric herbivores, including large herds of deer, elk, antelope, and other grazing animals, and without the competition from nonnative annuals which dominate much of the study area today. At present, appropriate livestock grazing utilizing cattle, sheep, and goats can be useful for range management, as a vegetation management tool to promote native plants and animals, and to reduce fuel loads for wildfires. In the study area, grazing has been shown to benefit most covered plant species and Bay checkerspot butterfly by reducing cover of invasive plants and increasing habitat for dwarf plantain, the butterfly's host plant (Weiss and Wright 2005, 2006; Santa Clara Valley Transportation Authority 2006; also see **Appendix D**). In addition, grazing and rangeland management practice have been demonstrated to benefit California tiger salamander and California red-legged frog. For these species, the USFWS issued a special Section 4(d) rule exempting ranch practices from a possible take because the benefit of these practices was deemed far greater than any potential individual loss.

Grazing may also benefit some ground-nesting or ground-foraging songbird species by providing variations in vegetative cover (Santa Clara Valley

Transportation Authority 2006). However, effects on all covered species are not quantified or fully understood, and it is possible that in some cases the effects of grazing on some covered plants may be detrimental (J. Hillman pers. comm.). Initially, vegetation management that is implemented will reduce the height of all vegetation to less than 12 inches (through grazing and mowing) (GRASS-8).

Grazing by livestock and native herbivores is a conservation action proposed for implementation in the Reserve System to enhance grasslands by creating structural diversity and increasing the abundance of native grassland species (GRASS-1). Several factors, including timing, stocking rate, rotation type, and grazing species, may affect the success of a grazing program (Sotoyome Resource Conservation District 2007). Tule elk may not be ideal native grazers on a large scale. Large herds of Tule elk may damage fences and disrupt livestock grazing programs (J. Fields pers. comm.). Fencing required to manage herds of Tule elk or other large herbivores may create barriers to wildlife movement.

Varying the timing (i.e., seasonal timing, annual timing) of grazing generally produces different effects across the landscape (Weiss 1999; Santa Clara Valley Transportation Authority 2006). A grazing treatment should be defined by the kinds and classes of livestock, their spatial distribution, their temporal distribution, and their density, and determines the effects of grazing on plants in the grazing area (Huntsinger, Bartolome, and D'Antonio 2007). For instance, researchers have observed that in serpentine grasslands, winter/spring grazing reduces annual grass cover more effectively than other grazing regimes (S. Weiss pers. comm.). While winter/spring grazing increases opportunities for dwarf plantain and other serpentine-adapted forbs, it can crush butterfly larvae, eggs, and pupae (Weiss 1999; Santa Clara Valley Transportation Authority 2006). Alternatively, summer/fall grazing may avoid butterfly larvae, eggs, and pupae; however the habitat created is not as high quality as that produced by the winter/spring regime (Santa Clara Valley Transportation Authority 2006; S. Weiss pers. comm.) Short-term winter grazing following burning may help to control exotic grasses as they germinate after winter rains, while mid-summer grazing may promote native perennial grasses because they are dormant at that time and not substantially damaged by grazing. These tradeoffs will need to be considered as reserve unit management plans are developed. For serpentine grassland, typical stocking rates and seasonality include 1 cow-calf per 10–15 acres for winter-spring (rainy season) or summer-fall (dry season), with small modifications according to short-term seasonal variations.

The stocking rate is the number of cattle grazing a given site for a given period of time. The stocking rate will be consistent with known or experimentally derived rates that promote native plants without adversely affecting covered species or causing long-term rangeland degradation. For example, excessive numbers of cattle in an area may trample Mt. Hamilton thistle, which occurs in serpentine soils in wet habitats such as serpentine seeps and springs, (J. Hillman pers. comm.) and Santa Clara dudleya, which occurs on serpentine rock outcrops (S. Weiss pers. comm.; J. Hillman pers. comm.).

Rotation of cattle on different pastures within and between years can influence the success of a grazing program. Grazing patterns and their effects on serpentine plants and insects are being tested on several sites in the study area, including Coyote Ridge and Tulare Hill. Current BMPs (Santa Clara Valley Transportation Authority 2006; S. Weiss pers. comm.; J. Fields pers. comm.) and research in various systems (Zervas 1998; Cousins et al. 2003) suggest that timing regimes should be consistent over long periods because frequent variation may increase nonnative cover and reduce habitat for native species. In view of this finding, consideration of historical patterns of currently grazed lands will direct decisions about grazing in the Reserve System. Current rotations will be monitored and only shifted if monitoring results indicate that the lands or covered species are adversely affected under the existing timing.

Different herbivorous species have different preferences and abilities to be selective grazers and therefore have different impacts on vegetation. Reserve unit management plans will take these differences into consideration.

Grazers will be excluded from some sensitive riparian areas (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*). In addition, targeted studies examining grazing exclusion from specific terrestrial areas may be considered for sensitive plant species. However small-scale exclusion fences in potentially remote areas are expensive and labor intensive to install and maintain. Therefore, exclusionary fencing will only be considered in areas where monitoring indicates that conservation targets are not being met or detrimental effects of grazing may actually hinder the survival of the species.

Reintroduction of livestock grazing into areas where it has been excluded is an important conservation action of the Plan, particularly on serpentine grasslands. For example, livestock grazing will be reintroduced onto serpentine grassland sites in Santa Teresa County Park (**Table 5-5**) to reduce the biomass and diversity of nonnative grasses and herbs. Reintroduction of grazing is expected to substantially enhance habitat for Bay checkerspot butterfly and several covered plants. Recovery with the reintroduction of grazing may take many years, however, as evidenced in the Silver Creek Hills (Wetlands Research Associates 2008). On Tulare Hill, Weiss and colleagues have noted that seedbanks from the final large cohort of native forbs in 2004 (3 years after the cessation of grazing) provided for dense native forb cover following a June 2004 fire on Tulare Hill (Metcalf Energy Center 2006). Once the native seedbank is depleted, restoration of high-quality serpentine grassland requires recolonization from forb-rich patches of thin soils, which is a much slower process.

In view of the uncertainty of relevant research results, it would be prudent to use grazing management at sites with high potential to improve existing stands of native grasses and other targeted species, and to focus on reduction of the non-native species competition in a heterogeneous pattern—some patches grazed more and some less. Such grazing would favor a diversity of conditions, including those more favorable to expansion and persistence of the natives (Fuhlendorf and Engle 2001). Extensive grazing of large pastures with the livestock dispersed for the entire grazing period will be more effective at producing such heterogeneity than would higher intensity rotational grazing of

smaller pastures. Recent research by Bartolome (2011) shows that undisturbed annual grassland patches with abundant native grasses are low in phosphorous, and the opposite is found at adjacent sites where no native grasses occur. Determining the potential of grassland sites for improvement in native grass abundance may be accomplished by correlating site conditions where native grasses are abundant, soil patches have low productivity, and soils have not been disturbed. Such determinations may be confirmed by analyses of phytolith evidence of prehistoric grasslands and perennial grasses (Bartolome and Evett 2010). Management treatments to improve native grass abundance should be focused only at grassland sites that have the indicators of potential, but do not already support abundant native grasses.

## Prescribed Burning

Prescribed burning as a strategy to manage grasslands has been studied extensively in California and elsewhere (Harrison et al. 2003; Rice 2005). A review of existing literature in 2004 found that burning has mixed results depending on the starting condition of the ecosystem and on the timing and frequency of the burns (Rice 2005). Research indicates that in order for fire to successfully reduce nonnative and increase native plant cover, burns must be targeted toward the specific system and species conditions.

Prescribed burning is a conservation action to enhance natural communities, to control or eradicate invasive plants, and prevent natural community type conversion (GRASS-2). If burns are implemented in the Reserve System as a management tool, considerations will include the blooming and seeding times of the targeted nonnative species, the history of site use, and the likely condition of the native soil seed bank. Fires will be conducted at a time when the seeds of the targeted invasive plants will be destroyed. Single burns are generally unsuccessful at restoring native diversity and cover to grasslands; multiple burns are usually required. Burning can be used in conjunction with grazing or mowing to control infestations of invasive species and brush. If native vegetation on a site has been particularly denuded, supplementary seeding of native species may be required.

In particular, prescribed burning within the Reserve System may be an effective tool to eradicate exotic invasive species that are selectively avoided by grazing livestock. An example of this is barbed goatgrass (*Aegilops triuncialis*), a species that recently invaded Coyote Ridge and seriously threatens serpentine grasslands in the study area (S. Weiss pers. comm.). Barbed goatgrass is avoided by livestock but can be controlled with prescribed burns that are appropriately timed (just after plants senesce but while seeds are still maturing) and repeated (probably at least 2 or 3 years in succession) (DiTomaso et al. 2001). A pilot project to eradicate barbed goatgrass through burning that was initiated in 2006 on Coyote Ridge has shown mixed results (S. Weiss pers. comm.). Additional burns occurred in 2007.

Prescribed burns have been conducted by State Parks in Henry W. Coe State Park and by the Open Space Authority on several parcels. Prescribed burns have been



conducted by County Parks at Joseph Grant, Motorcycle, Mount Madonna and Santa Teresa County Parks (D. Rocha pers. comm.). County Parks plans to conduct prescribed burns in Coyote Lake–Harvey Bear Ranch County Park in the future (Rana Creek Habitat Restoration 2004). Prescribed burns in the Reserve System will be planned and conducted using the techniques and lessons learned from these agencies on actual burns.

In areas that are deemed *No-Burn* areas, the Implementing Entity will utilize management strategies that mimic the affects of burning on grassland species (e.g., mowing, hand pulling, targeted herbicide application) (LM-9).

## Mowing

In some instances, mowing is a reasonable alternative to prescribed burns; mowing is a conservation action for selected areas when grazing is infeasible (LM-11, GRASS-3). Mowing can often be safer and easier to implement on small scales than fire. Like prescribed burning, mowing needs to be timed to target the blooming/seeding cycle of nonnative species. Mowing may be particularly useful and effective as a small-scale treatment in areas that cattle cannot or should not access or for other site-specific logistical reasons (for example, when removal of vegetation is required at a time other than when livestock are available). Discing as a management tool in grasslands is not recommended because it often destroys burrows for covered and other native species (e.g., western burrowing owl, San Joaquin kit fox), increases soil erosion, and creates invasion sites for noxious weeds.

## Seeding Native Forbs and Grasses

In order to protect genetic integrity of the local landscape and ecosystems it is recommended that natural revegetation of local ecotypes should be encouraged first by controlling weeds and non-native species and seeding of native species should only occur in areas where natural revegetation is unlikely to occur (California Native Plant Society 2001). Highly degraded grasslands; however, may need additional input of native seed to restore their functionality. Seeding of native forbs and grasses is a conservation action in support of grassland enhancement (GRASS-4). Seeding may include covered plant species. Where possible, seed sources of covered plants will come from the project site itself and, if unavailable from the project site, from adjacent or nearby sites within the same watershed (California Native Plant Society 2001). If no seed source is available from the same watershed, then the seed source will be from as close as possible. Decisions regarding where to introduce seed and from how far away to collect it will be made in light of all available information about the targeted species, the source population, and issues related to maintaining the genetic integrity of existing populations (California Native Plant Society 2001).

To maximize the success of seed addition, pretreatment (e.g., burning 1 year prior to seeding to reduce weed seeds on the surface and in litter) may be

required. Recent research conducted on serpentine grasslands in Santa Barbara suggests that seedlings of California native forbs can be excellent competitors when enough seeds are present to overcome the dominance in the seed pool of the exotic grasses and forbs (Seabloom et al. 2002). In a 5-year experiment, burning or mowing had no effect on the abundance or the proportion of native forbs without seeding. Targeted studies could test this approach by seeding grasslands with native and locally collected seeds within the reserves.

## Ground-Dwelling Mammals

California ground squirrels play a key role in the grassland natural community. They provide a prey base for raptors and other covered species such as San Joaquin kit fox. In addition, their burrows provide nest sites for burrowing owls, (although their name implies otherwise, burrowing owls do not typically excavate their own burrows) and refugia for covered amphibians.

Historically, hunting and rodenticides have been used to control rodents and reduce conflicts with livestock. These practices may have decreased the populations of rodents, reducing prey availability for their predators. For example, in 1975 California ground squirrel, one of the main prey items for San Joaquin kit fox, was severely reduced in Contra Costa County after extensive rodent eradication efforts (Bell et al. 1994). The history of rodent control in Santa Clara County is unknown.

Under the Plan, a conservation action proposes to minimize existing rodent control measures (e.g., poisoning, hunting, and trapping) in reserves (GRASS-5). Minimizing existing ground squirrel control measures may be sufficient to increase squirrel populations in some areas. However, some rodent control measures will likely remain necessary in certain areas where dense rodent populations may compromise important infrastructure (e.g., pond berms, road embankments, railroad beds, levees, dam faces). The use of rodenticides or other rodent control measures will be prohibited in reserves except as necessary to address adverse impacts on essential structures within or immediately adjacent to reserves, including recreational facilities incorporated into the Reserve System. In addition, the Implementing Entity will introduce livestock grazing where it is not currently used, and where conflicts with covered activities will be minimized, to reduce vegetative cover and biomass that currently excludes ground squirrels to encourage ground squirrel colonization of new areas within the Reserve System (GRASS-6).

## Threats and Uncertainties

While focusing on management of nonnative invasive species, the Implementing Entity must also have management practices in place to recognize and account for invasions of nonnative species that have not been previously documented in the study area. When a new invasion is documented, an analysis of the threat it poses to native species and the current extent of the invasion will be conducted in

accordance with the invasive plant component of the reserve unit management plan for the Reserve System. In addition, coordination with local, regional, and state-level weed management programs will ensure that new invasions are caught early and their impact on native species minimized. With foreseeable changes in climate, the threat of invasive plants and animals is expected to increase.

Another threat to grasslands, serpentine grasslands in particular, is the ongoing and increasing nitrogen deposition from air pollution (Weiss 1999; California Energy Commission 2006; see **Appendix E**). Nitrogen deposition is predicted to increase during and beyond the term of the Plan due to population growth in the region and from covered activities (although it could possibly decrease if future automobile technologies address this issue; see Chapter 4 and **Appendix E** for details). Serpentine soils are inherently nutrient poor and are particularly limited in available nitrogen. Most serpentine-endemic plant species have evolved to tolerate this condition, while competitive invasive species cannot do so. This nutrient deficiency is believed to be the primary mechanism by which serpentine soils retain a high degree of native diversity (Harrison 1999). Nitrogen deposition has been shown to greatly increase available nitrogen in the soils of the study area and in turn to potentially increase the success of plant invasions into serpentine areas (Weiss 1999). The same study also found that serpentine areas that are grazed do not suffer the same plant invasions, most likely due to the fact that cattle selectively graze the invasive grasses and leave the native species and also because the cattle effectively remove nitrogen from the site (Weiss 1999). Continued active management using livestock grazing, prescribed or natural burning, and other methods will therefore be essential to offsetting the potentially increasing threat of nitrogen deposition in this community. The long-term effects of N-deposition are unknown, but the working hypothesis is that existing grazing regimes will be able to maintain native biological diversity.

## **5.3.4 Chaparral and Northern Coastal Scrub Conservation and Management**

### **Biological Goals and Objectives**

The biological goals and objectives for chaparral and northern coastal scrub communities include enhancement to benefit covered and other native species. The Implementing Entity will accomplish this by protecting land that supports chaparral and northern coastal scrub land cover types through fee title purchase or conservation easement and managing that land as part of the Reserve System. Areas that are protected will contain the full range of chaparral and northern coastal scrub community vegetation associations. An additional objective is to promote regeneration and succession. These natural processes will in turn benefit native species that occur in these land cover types. Acquisition, enhancement, and management actions to achieve these goals are discussed below.

Chaparral and northern coastal scrub conservation and management are anticipated to benefit 15 covered species. Covered species use of the chaparral and northern coastal scrub natural community is varied. Wildlife species use includes upland, movement, and foraging habitat. Chaparral and northern coastal scrub also provide primary and secondary habitat for some covered plant species. Additional details on species specific conservation actions can be found in each of the species sections identified below; however, the following is a summary of covered species use of the chaparral and northern coastal scrub natural community.

Bay checkerspot butterfly uses chaparral and coastal scrub as movement habitat to move between serpentine grassland habitat patches (see Section 5.4.1 *Bay Checkerspot Butterfly*). California tiger salamander uses chaparral and coastal scrub as upland and movement habitat (see Section 5.4.2 *California Tiger Salamander*). California red-legged frog and western pond turtle use chaparral and coastal scrub as movement habitat (Section 5.4.3 *California Red-legged Frog* and Section 5.4.5 *Western Pond Turtle*). Mixed serpentine chaparral serves as primary habitat for Coyote ceanothus (see Section 5.4.11 *Coyote Ceanothus*). Northern sage scrub/ Diablan sage scrub provides secondary habitat for fragrant fritillary (see Section 5.4.14 *Fragrant Fritillary*). Chaparral provides secondary habitat for Loma Prieta hoita (see Section 5.4.15 *Loma Prieta Hoita*). Mixed serpentine chaparral as primary habitat and northern coastal scrub/ Diablan sage scrub provides secondary habitat for Most beautiful jewelflower (see Section 5.4.18 *Most Beautiful Jewelflower*). The acquisition and enhancement conservation actions identified in the following sections are intended benefit the species identified above and contribute to species recovery, as well as benefit the natural community.

## Acquisition and Enhancement

During Plan implementation, the Implementing Entity will protect, through fee title purchase or conservation easements, at least 2,500 acres of chaparral and northern coastal scrub (**Table 5-11**).

### Chaparral and Northern Scrub Acquisition

The Implementing Entity will acquire at least 400 acres of northern mixed chaparral/chamise chaparral (LAND-C1), at least 700 acres of mixed serpentine chaparral (LAND-C2), and at least 1,400 acres of northern coastal scrub/Diablan sage scrub (LAND-C3) (**Table 5-11**).

The Implementing Entity will acquire all land by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that chaparral and scrub preservation requirements be met prior to impacts occurring to each land cover type, with a 10% allowable deviation.

Acquisition of northern mixed chaparral/chamise chaparral will occur primarily in the Diablo Range in the Pacheco watershed. In the Santa Cruz Mountains, this land cover type is restricted to upper watersheds, so acquisition would occur primarily in Llagas-1, Uvas-1, and Pescadero-1. Acquisition of mixed serpentine chaparral will occur throughout the study area, but primarily on Coyote Ridge. Large stands of serpentine chaparral targeted for preservation are also present in the Santa Teresa Hills (Guadalupe-1), near Chesbro Reservoir (Llagas-2 and Uvas-1), and in the Pacheco watershed. Acquisition of northern coastal scrub/Diablan sage scrub will occur in the Diablo Range near San Felipe Creek and south of Henry W. Coe State Park. In the Santa Cruz Mountains, acquisition of northern coastal scrub/Diablan sage scrub will occur primarily near Pescadero Creek.

## Chaparral and Northern Scrub Enhancement

All chaparral acquired for and incorporated into the Reserve System (for the latter, see **Table 5-5**) will be enhanced. Chaparral and northern coastal scrub enhancement will begin immediately after reserve unit management plans are completed or updated for each reserve unit.

Enhancement techniques and frequencies and intensities of application will be informed by pre-acquisition assessments, baseline surveys, and targeted studies (see Chapter 7). Enhancement of chaparral and northern coastal scrub will occur by maintaining or reestablishing natural disturbances such as fire. This will create a mosaic of chaparral and northern coastal scrub stands with varying ages since the last fire, promoting native biological diversity and long-term persistence of this community. However, reestablishing fire through prescribed burning or wildfires will only be possible away from urban or rural areas to minimize risk to human health and structures.

As described in Chapter 3, chaparral and northern coastal scrub are dependent on periodic fires to maintain natural processes such as succession and regeneration. These processes ensure native species diversity and help reduce invasion by nonnative species. Some chaparral species require fire stimulation of the seedbank in order to regenerate. The natural fire frequency and intensity in chaparral and northern coastal scrub habitat is not well understood in the study area, and the effects of prescribed burns on species typically associated with these habitats is unknown. Enhancement of chaparral will involve an investigation of the use of fire to create structural diversity and/or other techniques that mimic the effects of fire.

The Implementing Entity will seek to address uncertainties regarding the enhancement of chaparral and northern coastal scrub through an adaptive management approach and through the monitoring program described in Chapter 7. Targeted research will be conducted to determine factors relevant to the health and regeneration of native chaparral/scrub species (STUDIES-2).

## Management Techniques and Tools

Biologically appropriate management techniques will be determined on a site-specific basis and may include those listed below.

- Minimum impact fire suppression techniques (described above in Section 5.3.2 *Landscape Conservation and Management* subheading *Fire Management*).
- Prescribed burning.
- Mechanical or hand clearing.

### Prescribed Burning

Where feasible, the Implementing Entity will conduct prescribed burns in chaparral and northern coastal scrub to maintain canopy gaps and promote regeneration (CHAP-1). Prescribed burns may also be needed on portions of the Reserve System closest to urban and suburban areas to reduce the risk of catastrophic wildfires. This management technique is based on four key assumptions: (1) the current fire-return interval in chaparral is longer than historic levels due to modern fire suppression, (2) new growth is lacking and dead material has increased, (3) vegetation density has increased as a result of fire suppression, and (4) this increase in vegetation density has increased the risk of high-intensity fire.

Prescribed burning in chaparral may reduce wildfire risk at some sites, but this benefit will be balanced with the consequences of fires that are too frequent. Fires that occur too frequently in chaparral may reduce chaparral biological diversity by eliminating species not adapted to frequent burning (Zedler et al. 1983). Chaparral that experiences frequent fires is exposed to high rates of erosion, which may damage watershed functions.

Prescribed fires in chaparral should be conducted in late fall or winter when weather conditions maximize the ability of fire crews to control the fire. Burns conducted at that time will exert less effect on the seed banks and reproductive capability of exotic plants. Fall and winter burns will be conducted carefully in order to minimize excessive mortality of native seed banks than can result from lengthy smoldering fires in wet soil conditions (Le Fer and Parker 2005).

### Mechanical/Hand Thinning

In areas where burning is not possible, other types of management will be implemented to increase structural diversity (e.g., canopy gaps, variety of stand ages). Mechanical or hand thinning may be used to promote structural diversity in these land cover types (CHAP-2). In addition, these management activities may be used prior to prescribed burns to reduce the chance that the fire will burn too hot and damage the seed bank, or that the fire will escape control due to heavy fuel loads.

## Threats and Uncertainties

Many land management plans recommend rotational burning of chaparral and other shrublands to maintain a mosaic of stand ages, providing the maximum benefit to these communities and minimizing the chances of catastrophic wildfire. However, recent research suggests that the assumptions on which these policies are based are erroneous for chaparral communities in southern California (Keeley 2002) and may be erroneous for chaparral communities in central and northern California as well (Keeley 2005). The frequency of fire in southern California shrublands has been as frequent or more frequent in the twentieth century than it was in the nineteenth century (prior to fire-suppression activities), partly because fire-suppression activities have been ineffective at reducing fire frequency in shrublands (Keeley et al. 1999; Keeley and Fotheringham 2001). This pattern appears to hold true in Santa Clara County. Between 1950 and 1985, fire frequency in the county increased significantly, then leveled off and held steady through 2005, despite dramatic population growth in the region (Keeley 2005). Thus, fire suppression has not prevented fires but has been successful at maintaining their frequency and size, despite the increase in ignition sources (i.e., people).

Fire hazard in chaparral habitat appears to be either independent of, or only weakly dependent on, stand age for the first 20 years after fire (Schoenberg et al. 2003). The frequency of severe weather conditions (e.g., low humidity, high winds, and drought) and the number of people with access to stands (providing an ignition source) appear to play much more important roles than do vegetation conditions in determining fire risk. This appears to be true in Santa Clara County, where more than 95% of fires (for the period 1945–2002) were ignited by humans rather than lightning (Keeley 2005). In fact, 60% of the years during that period experienced no lightning-caused fires at all.

Due to the level of uncertainty in managing chaparral and northern coastal scrub communities, some of the management will be undertaken experimentally (STUDIES-2), and changes to the type and frequency of management in all areas will be made through adaptive management.

In some areas, the dynamics of how chaparral or northern coastal scrub interacts with adjacent land cover types is unknown or not well understood. An example is the encroachment of Douglas-fir into chaparral communities on Mt. Tamalpais in Marin County, California. This encroachment is facilitated by the below-ground associations of fungi and plant roots (Horton et al 1999). The Implementing Entity will determine how other communities, such as grassland, oak woodland, and Douglas-fir forests, are affecting chaparral and northern coastal scrub and, as indicated by targeted studies and informed by the monitoring and adaptive management program, work to reduce that impact (CHAP-3).

## 5.3.5 Oak and Conifer Woodland Conservation and Management

### Biological Goals and Objectives

During Plan implementation, the Implementing Entity's goal will be to maintain and enhance oak and conifer woodlands to benefit covered and other native species. The Implementing Entity will accomplish this by protecting land that supports valley oak woodland, mixed oak woodland and forest, coast live oak forest and woodland, blue oak woodland, foothill pine-oak woodland, mixed evergreen forest, redwood forest, and knobcone pine woodland through fee title purchase or conservation easement and enhancing and managing that land as part of the Reserve System.

Areas that are protected will support the full range of oak or conifer woodland community associations found in the study area. Once protected, an additional objective is to enhance oak woodlands using specific management actions to promote regeneration that will in turn sustain beneficial processes and native species diversity. Objectives for conifer woodlands include creating and maintaining the appropriate structure, density, and species composition needed to sustain the natural processes and native species diversity that is typical of these communities. Those management actions are discussed below.

Oak and conifer woodland conservation and management are anticipated to benefit 16 covered species. Wildlife species use includes upland, movement, year-round, breeding and foraging habitat. Oak and conifer woodlands are known to provide primary and secondary habitat for covered plant species. Additional details on species specific conservation actions can be found in each of the species sections identified below; however, the following is a summary of covered species use of the oak and conifer woodland natural community.

Bay checkerspot butterfly uses oak woodlands as movement habitat to move between serpentine grassland habitat patches (see Section 5.4.1 *Bay Checkerspot Butterfly*). California tiger salamander uses oak and conifer woodlands as upland and movement habitat (see Section 5.4.2 *California Tiger Salamander*). California red-legged frog and western pond turtle use oak and conifer woodlands as movement habitat (Section 5.4.3 *California Red-legged Frog* and Section 5.4.5 *Western Pond Turtle*). Western pond turtle uses redwood forest as year-round habitat. Western burrowing owl uses valley oak woodlands for foraging and movement (see Section 5.4.6 *Western Burrowing Owl*). Tricolored blackbird uses valley oak woodlands as year-round foraging habitat (see Section 5.4.8 *Tricolored Blackbird*). San Joaquin kit fox uses oak woodlands with low densities of trees, at lower elevations and with gentle slopes for movement and foraging (see Section 5.4.9 *San Joaquin Kit Fox*). Several oak woodland types provide primary habitat for Santa Clara Valley dudleya (see Section 5.4.13 *Santa Clara Valley Dudleya*). Oak woodlands provide secondary habitat for fragrant fritillary (see Section 5.4.14 *Fragrant Fritillary*). Oak and conifer woodland types are known to provide primary habitat, while others may



provide suitable habitat for Loma Prieta hoita (see Section 5.4.15 *Loma Prieta Hoita*). The acquisition and enhancement conservation actions identified in the following sections are intended be beneficial for the natural community and the covered species identified above and contribute to species recovery.

## Acquisition and Enhancement

During Plan implementation, the Implementing Entity will protect, through fee title purchase or conservation easement, at least 17,100 acres of oak woodland (**Table 5-11**). In addition, the Implementing Entity will protect at least 500 acres of conifer woodland.

### Oak and Conifer Woodland Acquisition

Of the total acquisition of 12,900 acres, valley oak woodland will account for 1,700 acres (LAND-OC3), mixed oak woodland and forest will account for 7,100 acres (LAND-OC1), coast live oak woodland and forest will account for 2,900 acres (LAND-OC2), blue oak woodland will account for 1,100 acres (LAND-OC3), foothill pine-oak woodland will account for 80 acres (LAND-OC4), and mixed evergreen forest will account for 20 acres (LAND-OC5) (**Table 5-11**).

The Implementing Entity will acquire all land by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that oak and conifer woodland preservation requirements be met prior to impacts occurring to each land cover type, with a 10% allowable deviation.

Acquisition of oak woodland land cover types will occur throughout the Santa Cruz Mountains and the Diablo Range. Acquisition of mixed evergreen forest, which is restricted to the Santa Cruz Mountains, will occur in the upper Llagas and Uvas watersheds (Llagas-1 and Uvas-1). Valley oak woodland is largely restricted in the study area to the Diablo Range; acquisition of this land cover type will occur where some of the largest stands are found in the Pacheco watershed (Pacheco-4, Pacheco-7, Pacheco-8), near San Felipe Creek (Coyote-4) and in the Alameda Creek and Upper Penintencia Creek watersheds (Alameda-1 and Coyote-7). Portions of County parks to be incorporated into the Reserve System that will permanently protect and allow improved management of large stands of oak woodland include Almaden Quicksilver, Anderson Lake, Calero, Coyote Lake-Harvey Bear Ranch, Joseph Grant, and Santa Teresa (see **Table 5-5** and below for which land cover types benefit).

Acquisition of conifer woodland land cover types is limited to 10 acres of redwood forest (LAND-OC6). Land acquisition requirements for conifer woodland are modest because there are limited opportunities to protect these land cover types within the study area.

## Oak and Conifer Woodland Enhancement

All oak and conifer woodland land cover types acquired would be enhanced as indicated by pre-acquisition assessments, baseline surveys, and targeted studies and informed by the monitoring and adaptive management program. Oak and conifer woodland enhancement will occur immediately after reserve unit management plans are completed or updated for each reserve unit. Enhancement will occur in both the Santa Cruz Mountains and the Diablo Range in all oak and conifer woodlands acquired and protected in the Reserve System. Enhancement of oak and conifer woodland may be appropriate at several specific locations, such as those listed below (**Tables 5-5 and 5-22**).

- Almaden Quicksilver County Park (mixed oak woodland, blue oak woodland, and mixed evergreen forest).
- Calero County Park (mixed oak woodland).
- Joseph D. Grant County Park (valley oak woodland, blue oak woodland, mixed oak woodland).

Enhancement in oak woodland or conifer woodland would be determined on the basis of site conditions and needs, and may include the measures listed below.

- Reducing the cover and density of invasive plants.
- Reducing or eliminating exotic wildlife such as wild pigs.
- Restoring natural processes such as fire or moderate levels of grazing.
- In some instances, restoring historic densities of trees through planting acorns or seedlings where they have been removed, where they are not regenerating naturally, or where densities are low relative to vigorous reference stands due to past land uses.

## Management Techniques and Tools

### Oak Woodland

Many factors may influence the population dynamics of oak woodlands within the study area (Pavlik et al. 1991). A site-specific assessment is required to determine the factors most limiting to stands in reserves, and management will be prescribed accordingly. The factor that may be most limiting to oak woodlands in the study area is a lack of oak regeneration due to a high density of nonnative invasive plants in the understory. A recent study of the effects of wild pigs in Joseph D. Grant County Park showed that pigs can disturb up to 35–65% of the ground annually where they occur in high densities, and that they significantly reduce acorn survival (Sweitzer and Van Vuren 2002).

Some studies have found that browsing by deer or livestock can negatively affect recruitment (Borchert et al. 1989; Bartolome et al. 2002), while others have found that grazing by small mammals (Tyler et al. 2002) is detrimental. The Implementing Entity will experimentally manage oak woodlands to reduce

seedling mortality; increase seedling and sapling survival; and determine factors relevant to regeneration, including browsing by mammals, birds, and insects (STUDIES-3). In some cases, fencing may be necessary around seed trees or stands of juvenile oaks to exclude native herbivores such as California ground squirrels, rabbits, or black-tailed deer until juvenile trees grow above the browse line.

One possible approach might be to manage oak stands in reserves using the decision-making process adopted by Cal-Fire (Jones & Stokes Associates 1988) and used for management of oak stands in the Los Vaqueros Watershed in eastern Contra Costa County (Brady and Associates 1997; Jones & Stokes Associates 1991; Contra Costa Water District 2001). If canopy coverage is declining, stands will be surveyed to determine if recruitment is adequate to replace lost trees and meet canopy coverage goals. The age structure of the tree population will also be considered to determine if stands may be increasing or in decline. If surveys indicate that recruitment is insufficient, management actions will be implemented to improve recruitment. Decision-making would be reassessed every five years.

To aid in oak regeneration, the Implementing Entity will eradicate feral pigs where feasible, and will reduce the overall number of pigs in the Reserve System through fencing, trapping, or other control methods (LM-12). Henry W. Coe State Park has been operating a successful pig-trapping program for several years (Sweitzer and Loggins 2001) and could be used as a model for the Reserve System.

The Implementing Entity will continue to employ livestock grazing in areas where nonnative vegetation is preventing successful oak regeneration and recruitment (GRASS-1). Modifying livestock stocking rates, timing of grazing, grazer species, or livestock access to certain areas may improve results in oak or conifer woodland. Where grazing is not feasible or not successful, the Implementing Entity will mow, hand clear, or selectively apply herbicides to reduce the nonnative vegetation in the understory of oak woodlands (GRASS-3, LM-14, LM-11). Prescribed burning may also be used in low-density oak woodlands to reduce nonnative invasive grass cover beneath oaks and encourage growth of a native understory and oak seedlings (OAK-1). Oak woodlands will also benefit from a let-burn policy within the study area. Both prescribed burns and the let-burn policy are described above in Section 5.3.2 *Landscape Conservation and Management*.

## Conifer Woodland

Conifer woodlands within the study area may have grown denser over time with the suppression of fire and lack of management. There are three types of conifer communities in the study area: redwood forest, knobcone pine woodland, and ponderosa pine woodland; however, the Plan only requires the protection of redwood forest. All but 5 acres of ponderosa pine woodland occur within Henry W. Coe State Park, which is outside of the permit area, and within San Felipe Ranch, which is protected by conservation easement. Although five acres of

ponderosa pine woodland are located within the permit area, just north of Henry Coe State Park, impacts to ponderosa pine woodland are not covered under this Plan because there are no opportunities to mitigate and conserve the natural community within the permit area (**Table 5-11**). Knobcone pine woodlands do not provide important habitat for the covered species; as such they are not targeted for acquisition.

Redwood forest require tailored management techniques based on forest condition, levels of regeneration, and on management goals. Management of redwood forest within the Reserve System will focus on retaining stands of more natural densities that will promote a more natural succession of native species in the understory and mid-canopy. At times this goal may entail some targeted thinning. As indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, that thinning will involve conducting the appropriate type of prescribed burns in redwood forest (OAK-2). When burning is not possible, other forms of mechanical thinning (e.g., cutting) will be selectively used to reduce the densities of trees in target areas to promote a healthy understory and mid-canopy (OAK-3). Whenever thinning takes place it will be carried out experimentally to determine the factors relevant to regeneration and maintenance; adaptive management will inform changes in this practice as experimental programs generate a body of knowledge (STUDIES-4).

In redwood forests, redwood trees regenerate by sprouting from the base and therefore do not require frequent burning to expose bare soil for regeneration. Management issues in this forest type instead often focus on the reintroduction of fire for fuel reduction, and on trying to create a late successional stage forest, mimicking the old growth forests (G. Gray pers. comm.). Big Basin State Park has one of the largest redwood burn programs in the world. They conduct prescribed broadcast burns in second growth forest to help thin it. They do not conduct mechanical thinning due to cost and the potential for damage to trees by equipment. In the North Coast Redwoods State Parks District, management techniques vary by stand conditions and age of the trees. They may remove redwoods if they are too close together. In old-growth forests, 30 trees/acre is common. In second-growth forests, there can be 200–1,000+ trees/acre. In these densely packed stands, a fire would kill most of the trees, so they often only do mechanical thinning to reduce the available fuel while retaining many of the trees (J. Harris pers. comm.). All of the redwood forest in the study area is second growth forest. Therefore, the Implementing Entity will conduct mechanical thinning or develop a prescribed burning program based on stand conditions. Further research will be conducted on how to best recreate late successional forests (STUDIES-4).

## Threats and Uncertainties

Substantially reducing the feral pig population in the Reserve System is an important long-term goal that will benefit all oak and conifer woodland natural communities. However, to be successful, such an effort must also be promoted on private and public land adjacent to, but outside of the Reserve System. This

will reduce the number of pigs immigrating into the Reserve System. An extensive trapping effort has proven successful in Henry W. Coe State Park in recent years, substantially reducing the feral pig population and the habitat destruction that the pigs cause (B. Patrie pers. comm.). It is evident that the feral pig population can be controlled but not eliminated in the Reserve System and that some level of damage to natural communities is likely to continue even with aggressive control measures.

## 5.3.6 Riverine and Riparian Forest and Scrub Conservation and Management

### Biological Goals and Objectives

The overarching biological goals for riverine and riparian habitats are to improve the quality of streams and the hydrologic and geomorphic processes that support them to maintain a functional aquatic and riparian community that benefits covered species and promotes native biodiversity. An additional goal is to maintain a functional riparian forest and scrub community at a variety of successional stages and to improve these communities to benefit covered species and promote native biodiversity. This includes specific objectives to protect and restore streams, riparian forest and scrub, and intermittent/ephemeral upper watershed tributaries within and outside the Reserve System. Land acquisition will target protection of key high-quality stream reaches and riparian woodland land cover types that provide habitat for covered species. Stream segments that could benefit from restoration will also be targeted for acquisition to allow the Implementing Entity to conduct physical and biological improvements to selected streams (actions that are often not possible on private land). Degraded streams and riparian woodland/scrub within the Reserve System will be improved to the maximum extent possible to increase overall ecological functions and values (i.e., species richness and diversity, vegetative cover, wildlife habitat function) and to enhance the ability of these habitats to support existing and new populations of covered species. Additional objectives focus on promoting community functions and habitat heterogeneity and connectivity, including specific targets for maintaining hydrologic and geomorphic stream processes.

Riverine (i.e., streams) and riparian forest and scrub mitigation includes a minimum preservation and restoration requirements to contribute to recovery and impact based mitigation ratios (see Section 5.3.1 *Land Acquisition and Restoration Actions*, subheading *Acquisition and Restoration Requirements for Aquatic Land Cover Types* for rationale). The Plan requires a minimum amount of preservation and restoration to occur regardless of the level of impact to riverine and riparian land cover types (**Table 5-13**). These minimum requirements ensure that the conservation goals of the Plan will be met even if all of the anticipated impacts do not occur. Minimum preservation requirements can be met through the acres preserved according to the preservation mitigation ratios (minimum acres preserved are not in addition to acres preserved according to the

preservation mitigation ratios). The rationale for this is that the preservation ratios include a recovery component as explained Section 5.3.1 *Land Acquisition and Restoration Actions*, subheading *Acquisition and Restoration Requirements for Aquatic Land Cover Types* where factors used to determine the preservation ratios are identified.

The preservation and restoration mitigation ratios for streams and riparian forest and scrub are additive (**Table 5-12**). For example, for every 1 mile of streams impacted, 3 miles must be preserved and enhanced (3:1) and 1 mile must be restored (1:1). This results in a mitigation ratio of 4:1 for all stream impacts. For every 1 acre of willow riparian forest and scrub or mixed riparian forest and woodland impacted, 2 acres must be preserved and enhanced (2:1) and 1 acre must be restored (1:1). This results in a mitigation ratio of 3:1 for all impacts to willow riparian forest and scrub or mixed riparian forest and woodland. For every 1 acre of Central California sycamore alluvial woodland impacted, 2 acres must be preserved and enhanced (2:1) and 2 acres must be restored (2:1). This results in a mitigation ratio of 4:1 for all Central California sycamore alluvial woodland impacts.

Regardless of the level of impacts, a minimum of 250 acres of riparian forest and scrub, 40 acres of Central California sycamore alluvial woodland, and 100 miles of streams must be preserved and enhanced to contribute to recovery (**Table 5-13**).

As explained above, the preservation mitigation counts towards the minimum preservation requirement. For example, the impacts to streams are capped at 9.4 miles. If all impacts occur, 28.2 miles of streams must be preserved and enhanced (3:1 preservation ratio). Since the minimum preservation and enhancement requirement is 100 stream miles, the Implementing Entity will be required to preserve and enhance an additional 71.8 stream miles ( $28.2 + 71.8 = 100$ ) to meet the minimum requirement, if all impacts occur. The minimum target of 100 miles of streams was determined to meet multiple needs: requirements for stream mitigation, preservation of habitat for foothill yellow-legged frog that would contribute to species recovery, preservation of habitat for California red-legged frog and western pond turtle that would contribute to species recovery (along with preservation of ponds and freshwater wetlands), and mitigation for temporary impacts (48.0 miles of impacts over the permit term). The Reserve System is expected to preserve substantially more than 100 miles of streams.

The same rationale applies to Central California sycamore alluvial woodland. If all impacts occur, 14 acres of Central California sycamore alluvial woodland must be preserved and enhanced (2:1 preservation ratio). Since the minimum preservation and enhancement requirement is 40 acres, the Implementing Entity will be required to preserve and enhance an additional 26 acres of Central California sycamore alluvial woodland ( $14 + 26 = 40$ ) to meet the minimum requirement, if all impacts occur. For willow riparian forest and scrub or mixed riparian forest, impacts are capped at 289 acres. If all impacts occur, 578 acres of willow riparian forest and scrub or mixed riparian forest must be preserved and enhanced. In this case, if all impacts occur, the minimum preservation and

enhancement requirement of 250 acres will be met by the mitigation ratio. If less than 125 acres of impacts occur, the Implementing Entity will still be required to preserve and enhance 250 acres to meet the minimum preservation requirement.

Riverine and riparian forest and scrub conservation and management are anticipated to benefit 12 covered species. Wildlife use includes movement, foraging, breeding, and year-round habitat. The riparian forest and scrub natural community is known to provide primary for one covered plant, Loma Prieta hoita (see Section 5.4.15 *Loma Prieta Hoita*). Bay checkerspot butterfly uses riverine and riparian forest and scrub natural communities as movement habitat to move between serpentine grassland patches (see Section 5.4.1 *Bay Checkerspot Butterfly*). California tiger salamander uses the riverine natural community for foraging and movement habitat and riparian forest and scrub as movement habitat (see Section 5.4.2 *California Tiger Salamander*). California red-legged and western pond turtle use riverine and riparian forest and scrub natural communities as year-round habitat (see Section 5.4.3 *California Red-Legged Frog* and Section 5.4.5 *Western Pond Turtle*). Foothill yellow-legged frogs use the riverine natural community as year-round habitat and the riparian forest and scrub natural community as foraging and movement habitat. Least Bell's vireo uses riparian forest and scrub as foraging and breeding habitat (see Section 5.4.7 *Least Bell's Vireo*). Tricolored blackbird uses the riparian forest and scrub natural community as breeding and year-round habitat (see Section 5.4.8 *Tricolored Blackbird*). San Joaquin kit fox may use low-density riparian forest and scrub as movement habitat (see Section 5.4.9 *San Joaquin Kit Fox*). The riparian forest and scrub acquisition and enhancement conservation actions identified in the following sections are intended to benefit these species and the natural community as a whole.

## Acquisition, Enhancement, and Restoration

Conservation of riverine habitats and riparian woodland and scrub combine land acquisition, habitat restoration, and habitat enhancement. All Reserve System lands will be enhanced. Each of these components is described below separately for riverine and riparian communities. Separate discussions are provided for organizational purposes only. Riverine and riparian woodland and scrub communities are closely tied to one another ecologically and both communities are often present in the same location. Land acquisition and restoration will be planned and implemented for both communities simultaneously for the same sites.

### Riverine Acquisition

Streams (riverine habitat) will be preserved in the permit area at a ratio of 3 stream miles to every mile affected (**Table 5-12**). An estimated 9.4 miles of stream is the most that would be permanently affected by covered activities. If this maximum level is reached, then at least 28.2 miles of stream would need to

be preserved. The minimum requirement of stream preservation, regardless of the level of impact, is 100 miles (**Table 5-13**).

During Plan implementation, the Implementing Entity will therefore protect at least 100 miles of stream (LAND-L3) (**Table 5-11**) according to the land acquisition priorities described in Section 5.3.1 *Land Acquisition and Restoration Actions* and below. All Reserve System lands will be enhanced.

All riverine protection will occur by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that stream preservation requirements be met prior to stream impacts occurring, with a 10% allowable deviation. Because streams are distributed widely throughout the study area, they will be part of nearly every land acquisition. The Implementing Entity will protect stream segments on key stream reaches through land acquisition (fee title or purchased conservation easement) or through landowner dedications through the Stream and Riparian Setback Condition when covered activities are proposed (see Chapter 6, Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks* and **Figure 6-2**). Protection will provide opportunities to enhance habitat for native fish, covered amphibian and reptile species, and restore streams and riparian woodland and scrub. At a minimum, riverine acquisitions will include the following:

- Extending the Uvas Creek Park Preserve 1.6 miles upstream to Hecker Pass Highway and set back expected development adjacent to this stream segment to protect the Uvas Creek Corridor consistent with Goals 5-5, 5-7, and 5-8 of the approved City of Gilroy Hecker Pass Specific Plan (LAND-R1). The City of Gilroy Hecker Pass Specific Plan Goals 5-5, 5-7, and 5-8 are as follows:
  - *Goal 5-5: Extend the Uvas Creek Park Preserve and trail to the western boundary of the Hecker Pass Specific study area at the intersection of Uvas Creek and Hecker Pass Highway*
  - *Goal 5-7: Ensure the protection of Uvas Creek Corridor by establishing policies and protective measures for adjacent land uses.*
  - *Goal 5-8: Preserve and enhance the Uvas Creek corridor and the associated riparian habitat wherever possible.*
- At least 1.0 mile of Uvas Creek above Uvas Reservoir.
- At least 1.0 mile of Llagas Creek above Chesbro Reservoir. Pacheco Creek mainstem (2.0 miles) between Pacheco Reservoir and San Felipe Lake (LAND-R1).

Protected streams will include those in upper tributaries that have high sediment loads or other functional shortfalls that limit native fish productivity. Such streams have not been identified in the study area but likely include Bodfish Creek and Little Arthur Creek. Additional study will be needed in implementation to verify these assumptions and determine the locations of other functionally-limited streams.



## Riparian Acquisition

Willow riparian forest and scrub or mixed riparian forest and woodland would be acquired for the Reserve System, depending on the level of impact of covered activities (LAND-R2). Two acres of these land cover types would be acquired for every acre impacted by covered activities (2:1) (**Tables 5-13 and 5-21**). The Implementing Entity will protect, through fee title or conservation easement, a minimum of 250 acres of willow riparian forest and scrub or mixed riparian forest and woodland. If all impacts on these land cover types occur as predicted, then up to 578 acres would be acquired. Riparian woodland protection would occur primarily in north County on Upper Penitencia Creek, Upper Coyote Creek, and San Felipe Creek. In south County, riparian woodland protection would occur primarily on Uvas Creek, Bodfish Creek, Little Arthur Creek, Tar Creek, Pescadero Creek, Pajaro River, and Pacheco Creek and its tributaries (LAND-R2, LAND-R3). All Reserve System lands will be enhanced.

In addition to the riparian acquisition described above, a minimum of 40 acres of Central California sycamore alluvial woodland would be acquired for the Reserve System even though only 7 acres of impact are predicted (LAND-R2). This requirement is designed to ensure that this very rare and threatened land cover type (Keeler-Wolf et al. 1997) is adequately preserved in the study area.

All riparian woodland and scrub protection will occur by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that stream woodland and scrub protection requirements be met prior to impacts occurring to these land cover types, with a 10% allowable deviation.

## Riverine and Riparian Enhancement

All the riparian woodland/scrub and streams acquired and incorporated into the Reserve System would be enhanced, as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program. Up to approximately 592 acres of riparian woodland and scrub (including California sycamore alluvial woodland) and a minimum of 100 miles of stream will be enhanced in the Reserve System (**Tables 5-12 and 5-13**). Enhancement techniques are described below.

Habitat enhancement is the improvement of an existing terrestrial vegetation community or aquatic habitat. The overall goal of enhancement actions is to promote natural community functions and habitat heterogeneity and connectivity. Enhancement on streams and riparian woodland/scrub will occur throughout the Reserve System as indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program.

Enhancement of riparian woodland and scrub will include enhancing the cover, density, structural diversity, and species diversity of riparian vegetation in the understory or small stream segments (STREAM-2).

Riverine and riparian enhancement will occur immediately after reserve unit management plans are completed or updated for each reserve unit.

## Riverine Restoration

Stream restoration would be accomplished according to the level of impacts on streams. One mile of stream would be restored for every mile of stream permanently affected by covered activities (**Tables 5-13 and 5-21**). A minimum of 1.0 mile of stream would be restored to contribute to species recovery (i.e., regardless of the level of stream impact). If all impacts occur, 10.4 miles of stream would be restored. Stream restoration would occur within the Reserve System and outside the Reserve System in partnership with private and public landowners as long as the conditions specified in Section 5.2.5 *Land Management*, subsection *Habitat Restoration* are met. The Implementing Entity would conduct additional site assessments during implementation to identify specific restoration project areas based on the site selection guidelines described below. Stream restoration techniques and guidelines are defined below.

Habitat restoration is the establishment of a vegetation community or aquatic habitat in an area that historically supported it, but no longer does because of the loss of one or more required ecological factors or as a result of past disturbance. Unlike other natural communities for which restoration is required, streams are unique—restoration occurs within the footprint of existing streams, rather than the creation of new ones, with some exceptions such as Fisher Creek, where the stream has been historically redirected. Stream restoration is defined as any substantial physical alteration to stream systems to return them to natural or semi-natural conditions and to restore specific ecological function in a site where that function has been lost (see Section 5.2.5 *Land Management* and **Appendix A** for definitions). For example, stream restoration includes removing hardscape features from concrete-lined or rip-rapped stream banks or restoring earthen or otherwise engineered channels to a more natural condition that allows for water infiltration, percolation, and groundwater recharge (STREAM-4). Restoration may also, when absolutely necessary, include stabilizing stream banks to manage fine sediment inputs and preventing excessive erosion (STREAM-6).

All stream restoration construction will be completed by Year 40 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. All required stream restoration must be initiated (ground breaking) prior to impacts occurring to these land cover types. In addition, the Implementing Entity will complete stream restoration to contribute to species recovery according to the deadlines in **Table 5-14**.

## Riparian Restoration

Riparian restoration (STREAM-3) is required to offset any impacts on riparian woodland and scrub land cover types and to contribute to species recovery (e.g., least Bell's vireo). One acre of willow riparian forest and scrub or mixed

riparian forest and woodland, at a variety of successional stages, would be restored for every acre impacted by covered activities (**Table 5-12**).

Riparian restoration is defined as the re-establishment of riparian vegetation in areas where it has been severely degraded and once occurred. Stream restoration is defined for the purposes of this Plan as substantial physical modifications to stream banks or stream channels (see Section 5.2.5 *Land Management* and **Appendix A** for definitions). Riparian restoration and stream restoration may often occur together in the same location.

A minimum of 50 acres of willow riparian forest and scrub or mixed riparian forest and woodland would be restored in the Reserve System to contribute to the recovery of covered species and an estimated 289 acres would be restored to compensate for all impacts. Therefore, a total of 339 acres of these land cover types would be restored if all impacts occurred (**Tables 5-13 and 5-21**). Riparian restoration opportunities have not been evaluated in detail in the study area. Riparian restoration opportunities have been defined for Upper Penitencia Creek (Biotic Resources Group 2001) and within the City of San José (Jones & Stokes 2000).

Riparian restoration would occur within the Reserve System and outside the Reserve System in partnership with private and public landowners as long as the conditions specified in Section 5.2.5 *Land Management*, subheading *Habitat Restoration* are met. The Implementing Entity would conduct additional site assessments during implementation to identify specific restoration project areas based on the site selection guidelines described below. Site assessments are a necessary first step in the restoration design process and therefore will occur approximately one year before restoration projects are to be constructed in order to meet Stay-Ahead requirements and other deadlines (**Table 5-14**). The Implementing Entity would restore riparian woodland using techniques and guidelines described below.

An estimated 14 acres of Central California coastal sycamore alluvial woodland would be restored to compensate for the 7 acres of expected impacts (**Tables 5-13 and 5-21**). Opportunities for restoration of this land cover type are limited to locations where this land cover type can be supported (Keeler-Wolf et al. 1997). Examples include Pacheco Creek, Upper Coyote Creek, San Felipe Creek, and lower Uvas Creek.

Construction of all restoration of these land cover types will be completed by Year 40 and according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. All required restoration of riparian woodland and scrub must be initiated (ground breaking) prior to impacts occurring to these land cover types (see Section 8.6.1 for details). In addition, the Implementing Entity will complete restoration of riparian woodland to contribute to species recovery according to the deadlines in **Table 5-14** (Years 15, 30, and 40).

### **Guidelines for Selecting Restoration Sites**

Potential restoration sites in the study area will be evaluated in coordination with the other local agencies or organizations active in riparian restoration in the study area (e.g., SCVWD, The Nature Conservancy). As described in the Section 5.3.1 *Land Acquisition and Restoration Actions*, the Implementing Entity will likely be conducting most riparian restoration in the locations listed below.

- Coyote Creek and tributaries (including tributaries such as Fisher Creek and Thompson Creek).
- Alamitos Creek and tributaries.
- Los Gatos Creek below Vasona Dam
- Uvas and Carnadero Creeks (including tributaries such as Little Arthur Creek and Bodfish Creek), including reaches above Uvas Dam.
- Llagas Creek, particularly above Chesbro Dam.
- Pajaro River.
- Pacheco Creek.

Restoration sites will be selected according to criteria that include but are not limited to those listed below.

- The potential success of restoration activities, based on site-specific conditions (e.g., hydrology, soils).
- The ability of the site to support covered species after restoration.
- Historic conditions that supported or likely supported the target land cover type (San Francisco Estuary Institute 2007).
- The proximity of the site to the area in which streams or riparian woodland/scrub were (or are predicted to be) lost to covered activities.
- The proximity of the site to other intact riparian corridors that support, or are likely to support, covered species.
- The extent and quality of existing habitats (e.g., percent native vegetation and presence/absence of nonnative wildlife such as bullfrogs or cowbirds).
- Existing wildlife use and the potential for adverse effects of the restoration project (e.g., disturbance to or removal of existing wetland habitat).
- The ability of the restored stream and/or riparian woodland/scrub to contribute to the conservation goals of habitat connectivity in this Plan.

Riverine and riparian restoration sites will be selected using the best available assessments (e.g., Biotic Resources Group 2001 for Alum Rock County Park and Jones & Stokes 2000 for San José streams). Where assessments are not available, the Implementing Entity will, in coordination with the Wildlife Agencies, conduct detailed site assessments to determine the best available restoration sites.

### Site Restoration Plans

Detailed restoration plans, including plans and specifications, will be developed for individual sites or stream reaches based on specific geomorphic, hydraulic, and hydrologic conditions; extent and quality of existing habitats; existing wildlife use; and the potential for adverse effects (e.g., disturbance and/or removal of existing habitat or wetlands). Site restoration plans will be developed prior to construction of stream, riparian, and wetland restoration projects. These plans will be prepared consistent with the reserve unit management plan for the site<sup>26</sup>. Restoration plans will satisfy the requirements listed below.

- Define restoration goals and objectives, performance indicators, and success criteria.
- Collect and analyze baseline data (e.g., soil type and suitability for riparian planting, low-flow conditions, past land use history/alterations).
- Identify suitable/feasible restoration measures.
- Develop conceptual restoration designs.
- Develop detailed restoration designs (plans and specifications) that identify and describe construction methods, planting areas and methods, planting species (including collection and propagation methods), and maintenance requirements.
- Prepare an adaptive management and monitoring plan based on the guidelines in Chapter 7 that includes descriptions of responsible parties; monitoring methods and schedule; indicators (e.g., vegetative cover); success criteria (e.g., 20% cover by year 5); and adaptive management measures (e.g., replanting with different species).

## Management Techniques and Tools

### General Principles for Riverine/Riparian Management

Streams and adjacent riparian forest/scrub communities are dynamic habitats resulting from the confluence of hydrology with the geology, soils, and vegetation of the environment. The management tools discussed below will be used in concert to maintain natural or semi-natural functions or to achieve them in currently degraded communities. In many cases these techniques can also be used to manage existing high-quality habitats to the benefit of streams and riparian communities. Several guidance documents and local programs provide the basis for the selection and application of these management tools and techniques; these are listed below.

- *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 1998).
- *California Salmonid Stream Habitat Restoration Manual. Part XI, Riparian Habitat Restoration* (Circuit Rider Productions 2004).

<sup>26</sup> Site restoration plans on newly-acquired lands may be prepared prior to or concurrent with the reserve unit management plan.

- *Federal Stream Corridor Restoration Principles and Practices* (Federal Interagency Stream Restoration Working Group 1999).
- Three Creeks HCP (plan is pending)
- *Watershed Action Plan* (Santa Clara Basin Watershed Management Initiative 2003).
- Upper Llagas Creek Riparian Corridor Assessment (Tetra Tech, Inc. 2006).
- *Coyote Watershed Stream Stewardship Plan* (Santa Clara Valley Water District 2002c).
- *Stream Maintenance Program* (Santa Clara Valley Water District 2010).

Large riparian and stream restoration projects have been conducted or are planned in the permit area by SCVWD and other agencies along Guadalupe Creek, the Guadalupe River, Coyote Creek, Upper Penitencia Creek, and Llagas Creek. Project planning and construction documents and follow-up monitoring reports are excellent sources of information to guide future riparian and stream restoration and enhancement projects. Additional sources are provided below specifically for riparian restoration projects.

## In-Channel Habitat Management

In-channel habitat actions may include the complete restoration of the channel to remove anthropogenic features (e.g., concrete, earthen, or otherwise engineered channels), as well as enhancement actions that modify specific elements of in-channel habitat (e.g., large woody debris, gravel placement and cleaning, and laying back steep banks). Only in-channel restoration is covered in this section; each of the specific enhancement actions is covered in separate sections.

Formation and sustainability of riverine habitat is directly related to channel processes and channel form. Where these processes or forms are out of balance with their natural inputs or where they have been disturbed, restoration of the channel may be an appropriate technique to restore a sustainable natural channel and floodplain (STREAM-5).

The Implementing Entity will also reduce chronic anthropogenic sources of sediment and restore balanced input of substrate material within stream reaches. This will be accomplished through the implementation of conditions on covered activities that minimize inputs of fine sediment delivery to streams (STREAM-6; also see Chapter 6, Section 6.4.2, subheading *Condition 4 Stream Avoidance and Minimization for In-Stream Projects*). Stabilizing stream banks on selected reaches could also achieve this goal.

Channel restoration may entail direct restoration (reconstruction of a channel) or incremental process restoration (installation of a natural structural feature to induce change in a channel), consistent with the guidelines of the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 1998; Circuit Rider Productions 2004). Channel restoration can also be used to restore bank stability

and reduce bank erosion; such restoration may improve aquatic habitat and water quality. Channel restoration techniques may affect the local slope, length, sinuosity, and dimensions of the channel, as well as alter basic channel processes related to sediment transport, and are very useful for treating the underlying causes of habitat degradation, as seen within the study area in the restoration of Guadalupe Creek upstream of the confluence with the Guadalupe River near Almaden Lake. Channel restoration under the Habitat Plan would only be considered as a potential solution where there are chronic anthropogenic problems. In implementation, the effects of restoration on local channel geometry will be carefully considered and proper hydraulic analysis performed (Flosi et al. 1998).

Under the Habitat Plan, the Implementing Entity will restore concrete, earthen, or other engineered channels as part of the 10.4 miles of stream restoration (STREAM-4).

## **Riparian Vegetation Management**

Successful implementation of riparian restoration can, over time, result in significant improvements in the cover and diversity of desirable native riparian plant communities.

An excellent example of successful riparian and stream restoration is the Guadalupe Creek restoration project. The project combined channel realignment with retention of existing vegetation, extensive riparian enhancement plantings and placement of in-stream woody debris along more than 12,000 linear feet of the creek. The project was completed in 2002. As of 2007, the riparian vegetation has developed into a multi-storied canopy, indicative of a healthy riparian corridor.

Establishment and recovery of native riparian plants will be faster in sunny, low-elevation, or moist sites than in shady, higher-elevation, or arid sites. However, advantageous growing conditions can also trigger rapid establishment of weedy or undesirable aggressive species; accordingly, weeds at and upstream of project sites will be evaluated before implementation of any treatments. Invasive plant removal will continue until desirable riparian vegetation is established and target invasive plants are substantially eradicated (i.e., greater than 50% eradicated and not expanding in range).

Use of riparian management techniques will consider the land use setting—that is, whether the site is in an urban, agricultural, or wildland environment. Some riparian management treatments may be appropriate in one type of setting and not in another. For example, the allowable height of vegetation may be constrained by its proximity to utilities, to address safety concerns, or to preserve views.

When placing plant materials, fences, offsite watering facilities, plant irrigation systems, and other materials in the riparian zone, the effects of flood flows (e.g., deposition of sediments and debris, scour) must be taken into account. It may be

necessary to install such facilities outside the flood prone area. To address these issues, vegetation management techniques will be developed in consideration of the recommendations presented in Part XI, *Riparian Habitat Restoration*, of the *California Salmonid Stream Habitat Restoration Manual* (Circuit Rider Productions 2004). Irrigation systems may be necessary to help establish riparian vegetation temporarily. However, these systems will be installed so that they can be removed (or left in place non-functioning) once the vegetation becomes self-sustaining and no longer requires supplemental irrigation.

The Implementing Entity will develop a successional management strategy for riparian vegetation communities to ensure that a diverse cross section of successional stages is fostered in the riparian corridor to promote natural stream functions during the permit term. This management strategy will be incorporated into the reserve unit management plans prepared according to Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*. Reserve unit management plans must be prepared within 5 years of acquisition of the first parcel in the reserve unit.

The management strategy for successional riparian vegetation would be of greater importance downstream of reservoirs, where altered flow regimes reduce flood flows and the frequency and intensity of droughts, which would otherwise produce a mosaic of successional stages over time. This strategy may include such actions as girdling trees, moving gravel, or other techniques of managing physical process and vegetation to ensure a variety of successional stages of riparian forest and scrub land cover types. Development of the successional management strategy will be undertaken in consideration of existing plans in the study area, which can vary with the goals of the implementing agency and the context of the stream. Existing plans that could be used to inform this management strategy are listed below.

- *Coyote Creek Parkway County Park—Final Integrated Natural Resources Management Plan and Master Plan* (County of Santa Clara Parks and Recreation Department 2007).
- *Alum Rock Park Riparian Management Plan* (Biotic Resources Group 2001).
- *Riparian Restoration Action Plan for the City of San José* (Jones & Stokes 2000).
- *Stream Maintenance Program* (Santa Clara Valley Water District 2010).
- *Guidelines and Standards for Land Use Near Streams* (Santa Clara Valley Water District 2006).

## **Invasive Species Management**

The Habitat Plan includes objectives to reduce or remove invasive plant and fish species from stream channels to encourage establishment of native plant and wildlife species. Invasive species management will comprise existing actions under SCVWD's existing Stream Maintenance Program and additional actions under the Habitat Plan that are consistent with the Stream Management Program



and the Santa Clara County Integrated Pest Management Program and Pesticide Use Ordinance (Section B28-10). Invasive species management is described above in Section 5.3.2 *Landscape Conservation and Management*.

## **Livestock Management**

As part of the grazing management program (see Section 5.3.3 *Grassland Conservation and Management*) the Implementing Entity will exclude livestock along targeted stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions as needed. This program will be implemented within the Reserve System and could be implemented outside the Reserve System if appropriate willing partners are identified.

## **Private Landowner Education**

The Implementing Entity will develop Stream Management (Riparian Land Use) Guidelines for private landowners, and an educational program to assist in the implementation of the guidelines, within five years of permit issuance. Details are found in Section 5.3.2 *Landscape Conservation and Management* subheading *Public Education and Outreach* above.

## **Threats and Uncertainties**

Within the study area, the San Francisco Regional Board is developing Total Maximum Daily Loads (TMDLs) for mercury and diazinon that could influence the implementation of covered activities and the conservation strategy related to riverine habitats in the Guadalupe River watershed. Instream activities within the Guadalupe watershed (e.g., stream crossings, bank stabilization activities, barrier removal, and stream enhancement and restoration projects) could increase the methylation of mercury that is found in sediments resulting from historic mining operations in the watershed. Final targets and strategies related to mercury TMDLs in the study area will affect the Local Partners' (especially SCVWD's) management of sediment in streams and will potentially affect the cost of restoration and enhancement opportunities in the Guadalupe watershed.

Availability of water from Central Valley Project facilities currently substantially supplements water supply in north county streams. The impact of climate change on the availability of this water is critical to the Habitat Plan conservation activities. In addition, Sacramento-San Joaquin Delta water quality and endangered species concerns (delta smelt and central valley salmon and steelhead) are affecting, and will continue to affect to an unknown degree, the timing and amount of water diversions from the delta. Any loss of water supply as the result of drought conditions could reduce or eliminate water supply allocated for the conservation strategy.

The study area lies in an area with several major and minor faults; moreover, the study area is susceptible to significant wildfires in the dry months of June–October. These natural events have the ability to damage the Reserve System and certain structural elements of the conservation strategy.

Fire would remove vegetation, potentially including riparian vegetation, and, in the event of significant precipitation following the fire, could compromise water quality in streams and reservoirs by increasing turbidity, increasing suspended sediment loads, and introducing high volumes of organic carbon into watersheds. This may affect the suitability of habitat for native fish and covered amphibians. Additionally, loss of riparian vegetation can lead to loss of habitat for terrestrial species found in riparian habitats. See Chapter 10 for additional discussion of foreseeable and unforeseen circumstances addressed by this Plan.

### 5.3.7 Wetland and Pond Conservation and Management

#### Biological Goals and Objectives

During Plan implementation, the Implementing Entity will work toward the goal of maintaining and enhancing functional wetland and pond habitats to benefit covered and other native species. The Implementing Entity will accomplish this by protecting lands with predominantly grassland, oak woodland, and conifer woodland land cover and that contain ponds or wetlands through fee title purchase or conservation easement. The Reserve System will contain the full range of pond and seasonal and perennial wetland communities that occur within the study area, and those ponds and wetlands and their adjacent uplands will be managed as part of the Reserve System. In addition, all Reserve System lands will be enhanced. Freshwater perennial and seasonal wetlands and ponds enhancement includes increasing native vegetative cover, biomass, and structural diversity in and around the margins of these aquatic habitats.

Wetland and pond conservation and management will benefit 8 covered species. Wildlife use includes movement, foraging, breeding, and year-round habitat. Seasonal wetlands may provide suitable habitat for one covered plant, fragrant fritillary (see Section 5.4.14 *Fragrant Fritillary*). Bay checkerspot butterfly may use wetland and pond habitat for movement as they move within and between serpentine grassland habitat patches (see Section 5.4.1 *Bay Checkerspot Butterfly*). California tiger salamander uses wetland and pond habitats for breeding and foraging (see Section 5.4.2 *California Tiger Salamander*). California red-legged frog uses perennial wetlands as year-round habitat and seasonal wetlands and ponds for breeding and foraging (see Section 5.4.3 *California Red-legged Frog*). Western pond turtle uses perennial wetlands and ponds as year-round habitat and seasonal wetlands as foraging habitat (see Section 5.4.5 *Western Pond Turtle*). Western burrowing owl uses season wetlands as movement habitat (see Section 5.4.6 *Western Burrowing Owl*). Tricolored blackbird uses wetlands and ponds as foraging and breeding habitat

(see Section 5.4.8 *Tricolored Blackbird*). The acquisition, enhancement, restoration, and creation conservation actions identified in the following sections are intended to benefit these species and the natural communities.

The preservation and restoration/creation mitigation ratios for impacts to ponds and wetlands are additive (**Tables 5-13 and 5-21**). For example, for every one acre of perennial wetland impacted, 2 acres must be preserved and enhanced (2:1) and 1 acre must be restored (1:1). This results in a mitigation ratio of 3:1 for all perennial wetland impacts. For every 1 acre of seasonal wetlands impacted, 2 acres must be preserved and enhanced (2:1) and 2 acres must be restored (2:1). This results in a mitigation ratio of 4:1 for all impacts to seasonal wetlands. For every 1 acre of pond impacted, 2 acres must be preserved and enhanced (2:1) and 1 acre must be created (1:1). This results in a mitigation ratio of 3:1 for all pond impacts.

Regardless of the level of impacts, a minimum of 10 acres of perennial wetlands, 5 acres of seasonal wetlands, and 50 acres of ponds must be preserved to contribute to recovery. As explained above, minimum preservation requirement can be met by the impact ratios. For example, if 5 acres of perennial wetlands are impacted, and 10 acres are preserved, this will fulfill the minimum preservation requirement for perennial wetlands.

There are also minimum wetland restoration and pond creation requirements that must occur regardless of the level of impact (**Table 5-13**). In addition to the mitigation ratios, a total of 20 acres of perennial wetlands must be restored and 20 acres of ponds must be created to contribute to recovery.

Uplands between ponds and wetlands will be similarly managed to attain regional connectivity for native species (See Sections 5.3.3 *Grassland Conservation and Management* and 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*, above). Ultimately the result will be a wetland/pond/upland habitat matrix that will support multiple life stages of covered and other native species (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5). Ponds and wetlands will be further enhanced by eradicating or reducing exotic species (e.g., nonnative fish, bullfrogs, nonnative plants) that are detrimental to covered and other native pond and wetland species. These and other specific management prescriptions are discussed below.

## Acquisition, Enhancement, Restoration, and Creation

The Implementing Entity will acquire an estimated 184 acres of wetlands and ponds within the Reserve System (**Table 5-12**). The Implementing Entity will enhance all Reserve System lands. The Implementing Entity will also restore or create an estimated 147 acres of wetlands and ponds (**Tables 5-12 and 5-13**).

## Wetland and Pond Acquisition

The amount of wetlands and ponds protected will be driven, in part, by the level of impact. Wetland and pond impacts require a 2:1 preservation ratio. During Plan implementation, the Implementing Entity will protect an estimated 50 acres of perennial wetlands (coastal and valley freshwater marsh; LAND-WP1a, LAND-WP1b), 30 acres of seasonal wetlands (LAND-WP2a, LAND-WP2b), and 104 acres of ponds through fee title purchase or conservation easement and manage them as part of the Reserve System (**Table 5-12**).

Regardless of the level of impact, a minimum of 50 acres of ponds must be protected to protect habitat for covered species (tricolored blackbird, California red-legged frog, California tiger salamander, and western pond turtle; **Table 5-12**). Ponds will be protected on both sides of the Santa Clara Valley to ensure that representative populations of pond-associated covered species are included in the Reserve System (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5). The land acquisition strategy focuses on land acquisition in areas with higher concentrations of ponds; these areas include, but are not limited to, the area between Alum Rock Park and Joseph D. Grant County Park, the area between Cañada de Oro Preserve and Chesbro Reservoir, and the area south of Henry W. Coe State Park along the Cañada de los Osos. When possible, pond protection will be pursued within designated critical habitat for California tiger salamander and California red-legged frog. Joseph Grant County Park has existing open space that will be added to the Reserve System that includes substantial ponds (**Table 5-5**).

In addition to the pond acquisition described above, a minimum of 10 acres of perennial wetland and 5 acres of seasonal wetland will be acquired, regardless of the level of impact (**Table 5-13**). These land cover types are rare in the study area but occur mostly on the floor of the Santa Clara Valley or in the nearby foothills.

All wetland and pond protection will occur by Year 45 according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. This provision requires that stream woodland and scrub protection requirements be met prior to impacts occurring to these land cover types, with a 10% allowable deviation.

## Wetland and Pond Enhancement

The Implementing Entity will enhance all Reserve System lands. All estimated 184 acres of wetlands and ponds acquired for the Reserve System (**Table 5-12**) will be enhanced to benefit covered and other native species. In addition, the estimated 147 acres of wetlands and ponds restored and created will be maintained once they meet their success criteria, and enhanced, as indicated by targeted studies and informed by the monitoring and adaptive management program. Wetland and pond enhancement will begin immediately after reserve unit management plans are completed or updated for each reserve unit.

Habitat enhancement is the improvement of an existing terrestrial vegetation community or aquatic habitat. Within the Reserve System, degraded ponds and wetlands will be improved to increase overall ecological functions and values (e.g., native species richness and diversity, wildlife habitat function) and to enhance the ability of these habitats to support existing and new populations of covered species. Wetland and pond enhancement measures will be designed for specific wetland or pond types (e.g., hydrogeomorphic context, surrounding natural community) and, in some cases, for specific sites. As described below, the success of various techniques depends on the wetland or pond type and the site conditions under which they are applied. Wetlands or ponds that are highly degraded may require more intensive management. Wetlands or ponds already in good condition (e.g., that support healthy populations of covered species) may require little or no enhancement measures.

## Perennial and Seasonal Wetland Restoration

Wetland impacts require a 1:1 restoration ratio for perennial wetlands and 2:1 restoration ratio for seasonal wetlands. The Implementing Entity will restore freshwater perennial and seasonal wetlands in-kind within the Reserve System according to the level of impact to these land cover types. If all expected impacts occur, this will result in an estimated total restoration of 25 acres of freshwater marsh and 30 acres of seasonal wetlands, per the required mitigation ratio (**Table 5-12**). In addition to the mitigation ratios, the Implementing Entity will restore at least 20 acres of perennial wetlands within the Reserve System to contribute to recovery (POND-6) (**Table 5-13**). This wetland restoration will occur regardless of the level of impacts and will contribute to the recovery of covered wetland species.

Habitat restoration is the establishment of a vegetation community or aquatic habitat in an area that historically supported it, but no longer does because of the loss of one or more required ecological factors or as a result of past disturbance. Wetland restoration will be carried out in areas that will increase available habitat and enhance connectivity between existing ponds and wetlands within the Reserve System. Potential wetland restoration and pond creation sites will be selected within the same watershed as the expected wetland impacts. This prioritization will ensure that wetland mitigation occurs close to the impact area and preserves and enhances watershed functions. Restoration will occur on suitable soils and in areas where wetlands historically occurred and have since been drained or severely degraded. Additional site selection guidelines are provided below under *Guidelines for Selecting Restoration or Creation Sites*. Restoration may include recreating the historic topography of the site and planting native freshwater emergent and aquatic plants. Seasonal wetlands may be restored along floodplain benches of intermittent streams or in grassland swales. Additional guidelines for restoring wetlands is provided below under *Restoration and Creation Principles and Techniques*.

All restoration of these land cover types will be completed by Year 40 (i.e., construction will be completed) and according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. All required

restoration of perennial or seasonal wetlands must be initiated (ground breaking) prior to impacts occurring to these land cover types. In addition, the Implementing Entity will complete restoration of perennial wetland to contribute to species recovery according to the deadlines in **Table 5-14** (Years 15, 30, and 40).

## Pond Creation

Pond impacts require a 1:1 creation ratio (**Table 5-12**). The Implementing Entity will create ponds lost to covered activities, in-kind, within the Reserve System. The total allowable impact on pond land cover during the permit term is 52 acres. In addition to the creation ratio, the Implementing Entity will create a minimum of 20 acres of ponds to contribute to recovery (POND-9) (**Table 5-13**). Pond creation to contribute to recovery is in addition to the mitigation ratio and will occur regardless of the level of impacts on ponds to contribute to the recovery of covered pond species (California red-legged frog, California tiger salamander, western pond turtle). Consequently, an estimated 72 acres of ponds will be created and managed as part of the Reserve System to offset these impacts and contribute to species recovery (52 acres + 20 acres = 72 acres). Pond creation will increase available habitat and enhance connectivity among existing ponds and wetlands within the Reserve System (**Figure 3-13**). Pond creation will only occur off-stream to avoid additional impacts to streams. Additional site selection guidelines are provided below under *Guidelines for Selecting Restoration or Creation Sites*.

The Habitat Plan assumes that ponds will be created (i.e., development of the pond land cover type in an area that did not previously support it). However, if an existing or historic pond were degraded to the point that it lacks certain ecological functions that are essential to support covered species (e.g., a pond is filled with sediment and no longer holds water), then restoration of a pond may be counted toward the Plan's creation requirements for ponds. Whether a pond restoration may be counted toward pond creation requirements will be determined by the Implementing Entity and Wildlife Agencies during the Wildlife Agency review of the proposed restoration design.

New ponds will be sited to improve habitat connectivity for California red-legged frog, California tiger salamander, and western pond turtle. The Implementing Entity will identify gaps between occupied ponds that are greater than typical dispersal distances (e.g., California tiger salamander may travel up to 1.3 miles from a breeding site) but short enough such that the creation of a pond may bridge the gap.

Where feasible, created ponds will rely on passive management (e.g., they will dry on their own periodically) to minimize the need for artificial draining. However, all created ponds will include a mechanism for draining, to control bullfrogs and other invasive nonnative wildlife species (described in Section 5.3.2 *Landscape Conservation and Management*). Pond creation to mitigate for impacts will be accomplished by creating ponds of approximately the same size as those lost. Pond creation to contribute to recovery will be

accomplished by creating ponds with an approximate average size of 0.5 acre, although small isolated ponds may be created that are only a few meters across because such ponds may provide habitat for California red-legged frogs and California tiger salamander, but may not be attractive to bullfrogs (U.S. Fish and Wildlife Service 2002). Native emergent and aquatic vegetation will be planted in ponds to provide suitable breeding habitat for covered species. Additional guidelines for restoring wetlands is provided below under *Restoration and Creation Principles and Techniques*.

Construction of all ponds will be completed by Year 40 and according to the Stay-Ahead provision described in Chapter 8, Section 8.6.1 *Stay-Ahead Provision*. All required pond creation must be initiated (ground breaking) prior to impacts. In addition, the Implementing Entity will complete pond creation to contribute to species recovery according to the deadlines in **Table 5-14** (Years 15, 30, and 40).

## Management Techniques and Tools

### Wetland Restoration and Pond Creation

All wetlands and ponds restored or created will be designed to support covered aquatic or amphibian species when physical and biological conditions allow. Biologically appropriate management techniques will be determined on a site-specific basis.

#### Guidelines for Selecting Restoration or Creation Sites

Potential restoration sites will be identified and selected on the basis of their physical processes and hydrologic, geomorphic, and soil conditions to ensure that successful restoration can occur and be self-sustaining. Such an approach increases the likelihood of successful restoration and reduces long-term management and maintenance costs.

Restoration sites will be selected within the same watershed as the expected wetland impacts. This prioritization will ensure that wetland mitigation occurs close to the impact area and preserves and enhances watershed functions. Restoration of perennial and seasonal wetlands will occur on suitable soils and in areas where perennial wetlands historically occurred and have since been drained or severely degraded, if appropriate hydrologic conditions still exist (San Francisco Estuary Institute 2006, 2007).

Restoration sites will also be selected on the basis of their ability to support covered species, support implementation of species-specific conservation actions, and meet species-specific biological goals and objectives. For example, sites designed to support tricolored blackbird will be located a sufficient distance away from black-crowned night-heron rookeries to minimize predation on tricolored blackbirds. Sites designed to support breeding habitat for covered amphibians must have adequate nearby upland habitat. Restoration and creation sites for wetlands and ponds must meet minimum distances from urban

development to receive credit under this Plan (**Table 5-15**). Created ponds will be sited away from busy roads to reduce the likelihood of mortality during periods when frogs, turtles, and salamanders move between ponds and uplands. In accordance with the California red-legged frog Recovery Plan, ponds created to provide red-legged frog habitat shall incorporate the *Guidelines for Voluntary Pond Management for the Benefit of the California Red-legged Frog* or the best available science during Plan implementation. This currently includes the following siting and design criteria.

- Evaluate the distance from known occurrences California red-legged frog to increase the likelihood of species dispersal to the created habitat.
- Place ponds at least one kilometer (0.6 miles) from known occurrences of bullfrogs.

### **Restoration and Creation Principles and Techniques**

Wetland restoration or pond creation will be accomplished using the techniques outlined in this section.

#### **Coastal and Valley Freshwater Marsh Restoration (Perennial Wetlands)**

The Implementing Entity will restore perennial freshwater wetlands at a ratio of 1:1 to replace wetlands lost to covered activities (estimated to be 25 acres of compensation) and restore an additional 20 acres of perennial freshwater wetlands to contribute to species recovery (**Table 5-12**).

One of the key principles of successful restoration is the presence of the processes that create and maintain wetlands (Middleton 1999; Keddy 2000; Mitsch and Gosselink 1993). The most important processes are related to the availability of water and appropriate hydrology to create and maintain hydric soils and plants. Therefore, restoration of perennial wetlands will occur on sites with appropriate hydrology. This may include areas where perennial wetlands historically occurred and have since been drained or severely degraded. Additionally, there may be sites that are currently appropriate for perennial wetlands that did not historically support them, because of changing land uses and altered hydrologic flows. It is imperative that perennial wetlands restoration sites be located directly adjacent to or connected to a source of permanent water.

Restoration will occur on suitable soils and may include creating wetland topography. Specifically, this might include site grading and creation of depressions to hold water. The choice of plant species for perennial wetland restoration sites will be based on a palette of native wetland plants including freshwater emergent and aquatic species. The palette will be developed during the implementation process. Ideally, the plants will be grown from soil, seed, or plant stock from local wetland sites. In addition, vegetation is expected to evolve after the original planting such that “volunteer” species may move into the wetland over time. In some cases, this can include nonnative invasive species that are not desirable within the Reserve System. Therefore, restoration plans will include plans for management of nonnative invasions. Additional issues that will be addressed in wetland design include preventing fish from becoming trapped in the ponds if the hydrology source is from a perennial waterbody that supports fish (e.g., by the use of fish screens or other appropriate devices).



Examples of wetland restoration projects in the study area that will be consulted for lessons learned (e.g., the Coyote Creek wetland restoration project (SCVWD), which occurs off-channel on Coyote Creek adjacent to U.S. 101).

### **Seasonal Wetland Restoration**

The Implementing Entity will restore seasonal wetlands at a ratio of 2:1 to replace all functions and values lost to covered activities (estimated to be 30 acres<sup>27</sup> of compensation; **Table 5-12**).

As with perennial wetlands, the most important principle for successful restoration and maintenance of seasonal wetlands is appropriate hydrology. However, for seasonal wetlands, the source of water should be available during the winter rainy season and not available during the dry summer months. Therefore, seasonal wetland restoration will include appropriate hydrologic sources and processes to support the seasonality of the wetland feature. This may occur on sites that supported seasonal wetlands historically, if appropriate hydrologic processes are still in place or can be restored. It may also include sites that have been altered by recent land uses and now support suitable hydrology.

The soils for seasonal wetlands generally will have water-holding capacity. This usually means some amount of clay content. Soils will be examined and tested before seasonal wetlands are sited. The plant palette for seasonal wetlands, as with perennial wetlands, will be developed during the restoration planning process. The choice of plant species for seasonal wetland restoration sites will be based on a palette of native seasonal wetland plants. Plants used for restoration will ideally be grown from local plant sources (soil, seed, and plant stock).

Because plant species composition, along with hydrologic processes, may change after the original planting, “volunteer” species may move into the wetland over time. This is to be expected because wetlands are dynamic systems. In some cases, such changes may include nonnative invasive species that are not desirable within the Reserve System. Therefore, restoration plans will include plans for management of nonnative invasions.

### **Pond Creation**

Ponds will be created to support breeding habitat for California red-legged frog, California tiger salamander, western pond turtle, tricolored blackbird, or a combination of these species. Pond depth will be sufficient to provide suitable breeding habitat for red-legged frogs or tiger salamanders and to preclude dense growth of emergent aquatic vegetation. Pond size will vary depending on the availability of water and site and watershed conditions. Ponds will be created to supplement the existing important network of stock ponds that exist in the study area, particularly in the Diablo Range where livestock grazing is more common. Ponds will not be created in streams to avoid stream impacts, preclude fish-

<sup>27</sup> Actual acreage of seasonal wetland compensation is expected to be less than 30 acres because seasonal wetland impacts and compensation will be tracked based on the wetland delineation submitted to, and verified by, the Local jurisdictions or Implementing Entity (See Chapter 6, Section 6.8.4). This land cover type was mapped at a regional scale using wetland complexes rather than site-specific data.

stranding, and avoid creating predator sinks. Ponds will be created so that they can be drained if necessary to control bullfrogs and other nonnative invasive animals.

Sediment inputs to ponds must be controlled to maintain the pond in the long term and minimize the need for periodic dredging. Upstream in-channel measures and small forebays can be used to reduce sediment delivery to the created ponds.

Ponds will be designed so that they either do not retain water long enough to support establishment of bullfrogs, nonnative fish, or other predators of California red-legged frog and California tiger salamander, or can be artificially drained to deter such establishment. At the same time, they will be designed to remain ponded for sufficient duration to support successful breeding of California red-legged frog and/or California tiger salamander. A deep-water escape portion, deeper than 1 meter (3 feet) and shallow, tadpole- and juvenile rearing portion to provide high quality breeding habitat for California red-legged frog shall be included (U.S. Fish and Wildlife Service 2002). Native emergent and aquatic vegetation will be planted in ponds to provide suitable breeding habitat for these covered species.

## **Wetland and Pond Enhancement**

All wetlands and ponds within in the Reserve System will be enhanced. The Implementing Entity will use the management techniques described below to enhance Reserve System wetlands and ponds.

### **Vegetation Management**

Vegetation management is a critical component of optimizing the habitat function of ponds and wetlands for covered species. Consequently, wetland and pond vegetation will be managed depending on the site-specific conditions of individual wetlands and ponds, and will largely depend on the individual species or group of species targeted for enhancement (or removal in the case of invasive nonnative species). Vegetation management will involve several techniques, often used in concert, to achieve the species composition and habitat structure necessary to benefit covered and other native species.

Some existing ponds or wetlands and all created ponds or restored wetlands will be seeded with native vegetation appropriate for the surrounding natural communities for replacement of lost ecological services and function. Planting of emergent vegetation (POND-3) such as bulrushes or willows in ponds that lack vegetation can improve breeding habitat and cover for California red-legged frog, western pond turtle, and California tiger salamander in the deepwater portions (i.e., greater than 1 meter deep); however, they should be kept clear of the shallow portions as tadpole-rearing portions should remain unshaded and shallow for California red-legged frog breeding habitat (U.S. Fish and Wildlife Service 2002). Further, tall emergent vegetation, such as bulrushes, can provide roost and nest sites for tricolored blackbirds where the wetlands or ponds are located near foraging habitat. Wetlands or ponds with adjacent grasslands or oak

woodlands will benefit from selective seeding of native forbs or grasses in the uplands surrounding the pond/wetland fringe (GRASS-4).

Vegetation may have to be removed from ponds where little open water remains to improve conditions for western pond turtle, California tiger salamander, and California red-legged frog. Vegetation removal can be accomplished through grazing (see below), selective herbicide application using label-approved application technique and in calm winds, or mechanical means (LM-11, LM-14). Where feasible, prescribed burns will be used to control nonnative vegetation around ponds and wetlands and within pond or wetland complexes (GRASS-2). Any herbicide application conducted in ponds or wetlands must use products that have been approved for aquatic communities. Mechanical removal of vegetation would occur after the breeding season for wetland- and pond-dependent wildlife, including nesting migratory birds, to minimize impacts. If surveys identify California red-legged frog presence at a pond requiring vegetation management, such activities would be restricted to between August 30<sup>th</sup> and October 15<sup>th</sup>. In cases where covered species are dependent on nonnative vegetation (e.g., tricolored blackbirds nesting in Himalayan blackberry) the removal of nonnative vegetation will be undertaken in phases over a 3 to 4-year period and replaced with the appropriate native vegetation.

Overgrazing by cattle and rooting by feral pigs can cause trampling of vegetation, soil compaction, development of “cow contours,” and bank destabilization. Fencing ponds and wetlands (POND-1) has been shown to be a rapid, successful, and cost-effective method of enhancing some wetlands. After fencing, vegetation cover and wetland species diversity can increase substantially in stock ponds and other permanent or near-permanent freshwater wetlands that have been degraded by cattle grazing (Contra Costa Water District 2002). In this Plan, fencing locations and specifications will depend on several factors, including site-specific conditions and the biological objectives that are being addressed. Fencing wetlands may not be appropriate in locations where retaining open water for species such as western pond turtle and California tiger salamander is an objective. In such cases, fencing half of a pond or wetland (split fencing) may accommodate the needs of multiple covered species (U.S. Fish and Wildlife Service 2002).

Livestock grazing (LM-11) will be introduced or continued at some wetlands and ponds to eliminate or reduce cover of exotic plants and to maintain ponds by preventing excessive plant growth when such a technique is consistent with maintaining values for covered species. Grazing rotation and fencing can also reduce the erosive impacts described above. Ford et al. (2012) provide details about pond habitat quality for the special-status California red-legged frog and California tiger salamander. The period of a pond’s inundation is critical to habitat value as well as the livestock operation that is associated with the pond’s establishment and maintenance. Ponds that draw down in the late spring or early summer can become unsuitable for livestock use due to lack of water and dangerous muddy banks.

To support successful reproduction of these special-status amphibians, their pond or stream habitats must remain inundated long enough to support successful

metamorphosis, which for California red-legged frog is December through April, and for California tiger salamander through May (U.S. Fish and Wildlife Service 2010). The California red-legged frog need ponds with a mix of open surface water and vegetated cover in the pond and at the edges. Emergent and edge vegetation provides cover for adult frogs from native and non-native predators, which is especially important if the non-native predators are not controlled. Emergent or submerged vegetation is also important in providing structure for attachment of frog eggs. The California tiger salamander typically use ponds free of emergent vegetation. Aquatic vegetation can be compatible, especially submerged vegetation, but salamander breeding appears to be rare with moderate levels of emergent vegetation. Allowing limited livestock access to a pond will help maintain its usefulness as habitat for covered species by preventing excessive plant growth that can lead to rapid sedimentation of ponds (U.S. Fish and Wildlife Service 2002). Seasonally limited grazing can be effective at reducing competition for nonnative plant species in seasonal wetlands (Marty 2005).

In addition to managing grazing of ponds and wetlands, grazing of surrounding grassland will be managed to maintain optimal habitat conditions. The use of livestock grazing within the Reserve System is discussed above (Section 5.3.3 *Grassland Conservation and Management*).

### **Water and Other Management**

It is assumed that many ponds in the study area are in disrepair. Repairs could be made to improve water retention in ponds created as stock ponds that are not retaining water due to leaks and, as a result, not functioning properly as habitat for covered species. Additionally, pond capacity and water duration can be increased (e.g., by raising spillway elevations) to support covered species populations.

In order to retain the habitat quality of ponds and wetlands over time, occasional sediment removal may be needed to address the buildup of sediment that results from adjacent land use or upstream factors (POND-4). Dredging will be conducted during the non-breeding periods of covered and other native species.

The Implementing Entity will also work with private landowners who own key ponds to secure funding to improve and maintain their ponds as habitat for covered species (e.g., tricolored blackbird, California tiger salamander, California red-legged frog, or western pond turtle). The Implementing Entity will help landowners apply for existing grants to enhance pond and freshwater marsh habitat on their land (e.g., North American Wetlands Conservation Act Small Grants Program [USFWS], or Environmental Quality Incentives Program of the Farm Bill [USDA Natural Resources Conservation Service]) (POND-11, POND-14). The Implementing Entity will work closely with existing organizations that have strong relationships with private landowners such as the Natural Resources Conservation Service, the local Resource Conservation District, and the California Cattlemen's Association. A program could be developed in the study area modeled after the successful Alameda County Conservation Partnership in Alameda County. This program provides technical

assistance, funding, and permit streamlining to private landowners wishing to maintain and enhance stock ponds to benefit endangered species.

Coarse woody debris or anchored basking platforms will be installed in ponds to improve habitat for western pond turtles (Hays et al. 1999) (POND-2). This modification will increase the habitat value in locations with existing western pond turtles and in newly created ponds where it is hoped that new pond turtle populations will establish. These structures may also enhance habitat for native amphibian species.

### **Nonnative Wildlife Management**

The Implementing Entity will work to reduce and, where possible, eradicate nonnative exotic species that adversely affect native pond and wetland species. These efforts will include prescribed methods for removal of bullfrogs, mosquitofish, and nonnative predatory fish from stock ponds and wetlands within the Reserve System. Further, the Implementing Entity will reduce the overall population of feral pigs within the permit area to reduce degradation of pond and wetland habitats. In some cases monitoring exotic species can be best accomplished by documenting the impact of those species on natural landscapes. It would be difficult to census the number of feral pigs within the Reserve System without an extensive effort. However, rooting disturbance can be monitored. The pig population will be controlled to levels that do not preclude the Implementing Entity's ability to successfully reach the Plan's goals and objectives.

### **Private Landowner Education**

The Implementing Entity will establish a landowner education program to provide technical and financial assistance to maintain and enhance ponds and other wetlands on private lands. Wetland enhancement may include pond stabilization, nonnative species control, pond or wetland expansion, or water management structures. Details are found under *Public Education and Outreach* in Section 5.3.2 *Landscape Conservation and Management* above. A similar, successful program operates in Alameda County in similar habitat under the auspices of the Alameda County Resource Conservation District and the USDA National Resource Conservation Service.

## **Threats and Uncertainties**

In general it is anticipated that a greater acreage of ponds than of wetlands will be protected through fee title acquisition or conservation easement because wetland protection and restoration opportunities are likely to be rare on the Santa Clara Valley floor, where most of the study area's wetlands are found. Although pond habitat is not a complete surrogate for wetland habitat in terms of ecological services and function, it does support the necessary life history stages for all the covered pond species in this Plan. However, ponds will not be used as out-of-kind mitigation for impacts to wetlands.

When creating or restoring aquatic habitat, the success of the habitat transformation is always dependent upon adequate water supplies during critical

life stages of covered species. During periods of drought, pond and wetland habitat may dry prior to the completion of covered species' aquatic life stages (i.e., breeding ponds for California tiger salamander and/or California red legged frogs may dry prior to metamorphosis). While ponds and wetlands will be created or restored to periodically dry on their own, periods of extended drought are inevitable and may diminish the quality of the aquatic habitat in some years.

### **Limitations of Restoration**

Restoring or enhancing hydrologic function to the immediate watersheds of wetlands and ponds will enhance habitat function of these features. Upstream factors that may be contributing to the decline of seasonal wetlands in the study area include hydrologic changes that lead to channel incision, changes in channel runoff, hydrologic disconnection of channel and floodplain, lowering of groundwater, and reduction of soil moisture in riparian areas. A variety of methods/approaches are available to arrest channel incision. For example, grazing management and fencing (see above) can be used to curtail negative hydrologic effects. Check dams have been shown to be effective at arresting channel erosion in seasonal wetlands in the Los Vaqueros Watershed in Contra Costa County within 6 months of dam installation (Jones & Stokes Associates 1992). Over time, such small dams may also increase the recharge of the local aquifer, raising the water table and increasing soil moisture levels near the surface. This effect could, in turn, increase the cover and extent of seasonal wetland vegetation along stream channels.

### **Mosquito Abatement**

Enhancement of pond and wetland habitats must be balanced with the need to minimize mosquito production. Encouraging adequate populations of mosquito predators, such as native frogs, swallows, and bats, offers an approach to mosquito control that is compatible with management for covered species. Wetlands will be designed to reduce mosquito production by minimizing suitable habitat for mosquitoes (primarily *Culex tarsalis*) and other human disease vectors, particularly between mid-July and late September or October when mosquito productivity is highest. Any mosquito control activities to be performed on Reserve System land will be addressed in the reserve unit management plan in consultation with the Santa Clara County Vector Control District. The reserve unit management plan will detail the nature of mosquito control activities and explain specific measures implemented to avoid and minimize impacts to covered species consistent with the Habitat Plan.

## **5.4 Benefits of and Additional Conservation Actions for Covered Species**

Most species-specific conservation is accomplished by protecting, restoring, and managing natural communities as described above. For 17 of the covered species, a GIS-based approach was used to estimate the amount of modeled habitat to be protected within the Reserve System. The species account for most species contains a section called *Modeled Habitat Distribution in Study Area*

detailing the parameters used to identify modeled species habitat (see **Appendix D**). Modeled species habitat was overlaid with the proposed Reserve System (see Section 5.2.3 *Reserve System*). The amount of modeled species habitat protected within the proposed Reserve System is identified for each covered species below. In addition, the number and size (if known) of covered plant occurrences protected within the proposed Reserve System are also discussed. Some species-specific actions were also included within these natural community management sections. The following section describes the biological goals and objectives for covered species and summarizes the benefits of the conservation actions for each species. When applicable, conservation actions in this Plan are related to federal critical habitat designations and federal Recovery Plan actions.

As discussed in Chapter 1, California State Parks lands are excluded from the permit area. Because of this exclusion, all of the land cover-related analyses in the Plan are based on the study area less State Parks lands unless otherwise noted. The size of the study area less State Parks lands is 460,205 acres.

## 5.4.1 Bay Checkerspot Butterfly

### Biological Goals and Objectives

The Implementing Entity will improve the viability of existing Bay checkerspot butterfly populations, increase the total number of populations, and expand the geographic distribution of the species to ensure its long-term persistence in the study area. This will be accomplished by protecting most serpentine grasslands within the study area to ensure protection of the ranges of slopes, aspects, and microhabitats important to the species. Acquisition, enhancement, and restoration/creation of natural communities adjacent to serpentine grasslands, including grasslands (see Section 5.3.3 *Grassland Conservation and Management*), chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*), oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and wetlands and ponds (see Section 5.3.7 *Wetland and Pond Conservation and Management*) are expected to benefit Bay checkerspot butterfly through the conservation and management of movement habitat.

Additionally, the Implementing Entity will improve management in degraded serpentine grasslands in the Reserve System to enhance populations of the larval host plants and adult nectar sources to benefit Bay checkerspot butterfly populations.

## Habitat Acquisition and Enhancement

The 1998 serpentine soils species Recovery Plan prioritizes 8,674 acres of then-unprotected habitat (i.e., not “fully or partially protected park lands”) within specific portions of the study area that “are considered essential to the recovery” of the species (U.S. Fish and Wildlife Service 1998a). The 1998 Recovery Plan also states that there are “other current or historic localities or suitable habitat areas, generally larger than” 2.5 acres that are also “essential to the recovery” of the species; however, these areas were not specifically identified (U.S. Fish and Wildlife Service 1998a). These prioritizations for protection were based on habitat mapping that occurred prior to the development of the Habitat Plan. The mapping of Bay checkerspot habitat for the Plan resulted in a new more accurate estimate of unprotected habitat in the study area of a total of 7,285 acres (total habitat modeled less habitat in Type 1 Open Space) (**Table 5-7**; see Chapter 3 and the species account in **Appendix D** for details on the habitat mapping).

Habitat models developed for this Plan estimated 8,621 acres of Bay checkerspot butterfly modeled habitat within the study area; this does not include all serpentine bunchgrass lands within the study area. Areas mapped as serpentine rock outcrop in this Plan are excluded from modeled Bay checkerspot butterfly habitat because these land cover types are assumed to be barren and thus not considered suitable habitat for the species. 2,921 acres (34%) of modeled habitat are located on Type 1, 2, or 3 open space with 1,336 acres (15%) permanently protected as Type 1 open space. The Plan will acquire 3,800 acres of lands modeled as habitat for the Reserve System and add 754 acres of modeled habitat from existing open space to the Reserve System (**Table 5-17**). With the total Reserve System lands (4,554 acres = 3,800 acres + 754 acres) added to land already protected as Type 1 open space (1,336 acres), a total of 5,890 acres of Bay checkerspot butterfly modeled habitat would be protected, or 68% of total modeled habitat in the study area.

The Implementing Entity will protect at least 4,000 acres of serpentine bunchgrass grassland (**Tables 5-19**) (3,800 acres of which includes modeled habitat for Bay checkerspot butterfly) through fee title acquisition or the acquisition of conservation easements. The conservation strategy for the Bay checkerspot butterfly, in combination with existing Type 1 open space, protects 70% of the core habitat on Coyote Ridge, extending from the north end of Coyote Ridge south to Anderson Dam (including the Pigeon Point unit). This acquisition will include the core habitats along the ridge tops, which have historically (since 1984) supported the densest populations of Bay checkerspot butterfly. Of the 4,000 acres of serpentine grassland to be preserved, the proposal is to acquire a minimum of 2,900 acres located on Coyote Ridge (LAND-L5). Extensive land acquisition will occur in all four of the core habitat areas as defined in the Recovery Plan for the species (U.S. Fish and Wildlife Service 1998a): Kirby, Metcalf, San Felipe, and Silver Creek Hills (see **Table 5-7** for a cross-walk of site names between this Plan and the Recovery Plan). The primary focus of land acquisition will be Coyote Ridge. The Plan also protects secondary sites deemed essential for the recovery of the species, including:



- The Santa Teresa Hills, a “potential core area” and “stepping stone” in the Recovery Plan. Approximately 877 acres (53%) of Santa Teresa County Park are proposed for incorporation into the Reserve System and would be managed to improve habitat for this species; most of this area supports serpentine bunchgrass grassland (over 670 acres). Once enhanced through livestock grazing, the improved habitat is expected to attract Bay checkerspot butterfly back to this part to re-establish a lost population (**Table 5-5**)<sup>28</sup>.
- Tulare Hill (deemed an important corridor for this species to connect populations in the Diablo Range with populations in the Santa Cruz Mountains),
- West hills of the Santa Clara Valley: 75% of the currently unprotected portions of Hale/Falcon Crest, Kalana Avenue, and Canada Garcia sites.

Land acquisition will protect occupied and potential habitat for the species, and protect critical linkages for the species. Protection of landscape linkages 6 and 8 (**Table 5-9** and **Figure 5-9**) will directly benefit Bay checkerspot butterfly. Protection of the linkage between the Silver Creek and Metcalf populations (LAND-9, LAND-L4) and the linkage between Coyote Ridge and Tulare Hill is critical for the species and will be necessary to meet the biological goals and objectives for this species.

The Implementing Entity will acquire and manage enough habitat to ensure occupancy by Bay checkerspot butterfly of each of the four core habitat units identified in the 1998 Serpentine Recovery Plan (Kirby, Metcalf, San Felipe, and Silver Creek Hills). Occupancy in these four core habitat units will be demonstrated at least four out of every 10 consecutive years of the permit term. The Implementing Entity will also acquire and manage land to ensure occupancy of at least three of the six (50%) satellite habitat units identified in the 1998 serpentine Recovery Plan (**Table 5-7**) by Year 45 (see Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Acquisition of Occupied Habitat for Select Wildlife Species*).

Successful implementation of the Plan will result in the protection of a portion of all Bay checkerspot critical habitat units (**Table 5-21** and **Figure 4-3**) (U.S. Fish and Wildlife Service 2008). In most cases, more than 48% of each of the 9 critical habitat units will be protected.<sup>29</sup> Habitat protection will occur on Coyote Ridge (northwest and southeast of Motorcycle County Park; Units 5 and 13), Tulare Hill (Unit 6), Santa Teresa Hills (Unit 7), west of Calero Reservoir (Unit 8), the Kalanas and Hale/Falcon Crest (Units 9a and 10), and Bear Ranch (Unit 11) (LAND-G3). These acquisitions will permanently protect important linkages between core and satellite habitat units and guarantee standardized management and monitoring, something that has not occurred in the past. Protection of sites will be prioritized according to threat, occupancy history and

<sup>28</sup> Estimates of County Park lands incorporated into the Reserve System are approximations. Final amounts will be determined during implementation when conservation easements are established and more detailed mapping is conducted.

<sup>29</sup> Critical habitat units 9a and 9b are referred to a single unit in this Plan. Reference to % protected includes existing Type 1 Open Space at the time of permit issuance in addition to critical habitat preserved during the permit term.

at the time of acquisition, proximity to occupied habitat, and prevalence of cool microsites with the proper slope, aspect, and microclimate for Bay checkerspot butterflies. All land protected will be enhanced, as described below. See Chapter 4, Section 4.7.1 *Bay Checkerspot Butterfly*, for a discussion regarding the limitations of land acquisition in specific Bay checkerspot critical habitat units.

Most of the serpentine areas in the study area are expected to be acquired as part of the Reserve System (see above). While the allowable impacts to serpentine bunchgrass grassland is limited to 550 acres (**Table 4-2**), impacts to Bay checkerspot butterfly modeled habitat mapped (see **Appendix D** and **Table 5-7**) as “occupied” or “potential” are capped at 300 acres (**Table 4-4**). Impacts to modeled habitat mapped as “historic/unoccupied” and “occupancy unknown” are not subject to this cap. In addition, impacts to Bay checkerspot butterfly modeled habitat is limited to no more than 3% of the unprotected portion (everything except Type 1 open space) of any core or satellite habitat unit targeted for conservation (as defined in **Table 5-7**). The one exception is the Kirby/East Hills core habitat unit which has an 11% allowance to accommodate the Kirby Landfill expansion (80 acres). Therefore, impacts to Bay checkerspot butterfly modeled habitat are limited in total amount (up to 4% of total modeled habitat) and in geographic scope (no more than 3% of any one core or satellite habitat unit targeted for conservation with one exception). These caps do not apply to habitat units in Type 1 open space because loss of habitat will be extremely limited in permanently protected open space (i.e., limited to trail construction and management activities).

Some impacts on serpentine grassland may still occur. Because of the high importance and rarity of serpentine soils and their habitats, these areas will be avoided whenever feasible during project planning (see Chapter 6, Section 6.5, subheading *Condition 13 Serpentine and Associated Covered Species Avoidance and Minimization*).

In the study area, an estimated 12% of designated critical habitat for Bay checkerspot butterfly is currently protected as Type 1 open space and another 25% occurs in open space Types 2, 3, and 4 (**Table 5-21**). Portions of the critical habitat units have been preserved through project compensation (e.g., Silver Creek Hills) and conservation agreements and easements from private entities (e.g., Tulare Hill and Kirby Canyon Landfill). However, this leaves 38% of critical habitat outside any type of open space. The Habitat Plan will protect an estimated 66% of all critical habitat not currently protected under Type 1 open space, including existing parklands that will be incorporated into the Reserve System. When added to the currently protected portions of critical habitat, approximately 70% of Bay checkerspot critical habitat in the study area will be preserved as Type 1 open space upon successful implementation of the Habitat Plan.

## Management Techniques and Tools

The general principles for grassland management will be followed in all serpentine grassland areas (Section 5.3.3 *Grassland Conservation and Management*). All management actions in this Plan are consistent with management guidelines in the species' Recovery Plan (U.S. Fish and Wildlife Service 1998a).

Once land is protected it will be beneficially managed for Bay checkerspot butterflies. The Implementing Entity will also enhance degraded areas to benefit serpentine grasses and encourage growth of host plants and nectar sources for the butterfly through techniques such as exotic plant control and removal, beneficial livestock grazing, and prescribed burning (GRASS-2). In the study area, grazing has been shown to benefit most covered plant species and Bay checkerspot butterfly by reducing cover of invasive plants and increasing habitat for dwarf plantain, the butterfly's host plant (Weiss and Wright 2005, 2006; Santa Clara Valley Transportation Authority 2006).

It is expected that Bay checkerspot butterflies from core populations will colonize previously unoccupied areas or areas that historically supported the species but lost its habitat value (i.e., lack of grazing, etc.). If it becomes apparent that site management is adequate and natural dispersal is not occurring, the Implementing Entity may translocate individuals (i.e., assisted migration) to increase the distribution of the species in the study area. The decision of when this should occur would be made in coordination with species experts and the Wildlife Agencies. At a minimum, the Implementing Entity will propose translocation efforts if natural colonization fails after five seasons in which core populations are at above-average population sizes. In such an event, Bay checkerspot butterflies (eggs, larvae, or adults) may be translocated from core populations into suitable but unoccupied sites to reestablish populations (GRASS-7). Translocation proposals will be provided to CDFG and USFWS for review and approval before translocation efforts are implemented and will be carried out experimentally. This is an important action identified in the Recovery Plan (U.S. Fish and Wildlife Service 1998a).

Public education and outreach is also identified as an important action in the species' Recovery Plan. The Habitat Plan provides funding for a full-time public education and outreach specialist, as well as public outreach materials. As described in this chapter, the focus of the public outreach and education campaign will be to work with landowners to minimize their impacts and improve their management to benefit covered species. Because some Bay checkerspot butterfly habitat will remain in private ownership (even after full implementation of this Plan), landowner outreach will be important to ensure populations persist on these sites.

## Threats and Uncertainties

Because this Plan will protect in perpetuity the majority of the remaining occupied and suitable habitat for this species, the threat of habitat loss from development will be greatly reduced. However, there will be a continued threat from nitrogen deposition on serpentine grasslands and the encroachment of nonnative grasses and herbs. Active livestock grazing and other management will minimize these on-going (and, over time, increasing) effects. Because management and monitoring for this species has been ongoing for many years, many of the management and monitoring techniques are well established and can be applied immediately following acquisition of new lands for the Reserve System, if funds are available (see Section 5.2.5 *Land Management*). The success of translocation is unknown but it may be attempted experimentally under the Plan to address this uncertainty.

### 5.4.2 California Tiger Salamander

#### Biological Goals and Objectives

The Implementing Entity will support viable populations and contribute to the regional recovery of the California tiger salamander by increasing the number of individuals and expanding the distribution of this species within the Reserve System. This will be accomplished by protecting and enhancing land through fee title purchase or by obtaining easements that are managed as part of the Reserve System.

Within the Reserve System the amount and quality of California tiger salamander habitat will be increased and improved through restoration, enhancement and creation of breeding and upland habitat. Lands that are protected will include land cover types that provide breeding habitat like ponds and wetlands and upland habitat like grassland, oak woodland, riparian, or chaparral. Acquisition, enhancement, and restoration/creation conservation actions identified for the following natural communities will benefit California tiger salamander through upland, movement, breeding, and foraging habitat conservation and management:

- grasslands (see Section 5.3.3 *Grassland Conservation and Management*),
- chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*),
- oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*),
- riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and
- wetlands and ponds (see Section 5.3.7 *Wetland and Pond Conservation and Management*).

The Reserve System will be designed to maintain and improve connectivity between breeding habitat and upland habitat and to provide essential upland refugia by protecting areas with existing ground squirrel colonies or promoting new colonies in areas adjacent to known California tiger salamander breeding habitat. The Reserve System will be designed to reduce habitat fragmentation, which in turn will ensure that proper genetic exchange can occur and that the population has the opportunity to expand its distribution within the study area. In addition, the Reserve System will link California tiger salamander habitat within the study area to areas important to the species outside of the study area, such as San Francisco Public Utilities Commission Alameda Watershed properties in Santa Clara and Alameda counties and the Soap Lake region in San Benito County.

## Habitat Acquisition, Restoration, and Creation

There are 324,748 acres of California tiger salamander modeled habitat (breeding and non-breeding) within the study area. There are 97,423 acres (30%) of modeled habitat located on Type 1, 2, or 3 open space with 45,767 acres (14%) permanently protected as Type 1 open space. The Plan will acquire a minimum of 30,150 acres of modeled habitat for the Reserve System. In addition, 11,745 acres of modeled habitat will be added to the Reserve System from existing open space. This will nearly double the proportion of California tiger salamander modeled habitat in the study area in Type 1 open space (to 27%) and increase Type 1, 2, or 3 open space to 39% (**Table 5-17**). This includes 195 acres of modeled breeding habitat (150 acres of newly acquired land and 45 acres of existing open space incorporated into the Reserve System) and 41,700 acres of modeled upland habitat (30,000 acres of newly acquired land and 11,700 acres of existing open space incorporated into the Reserve System).

The Implementing Entity will protect (through acquisition or easement) and enhance a minimum of 50 acres of ponds that either support, or have the potential to support, breeding California tiger salamander. In addition, a minimum of 20 acres of ponds will be created that either support or have the potential to support breeding California tiger salamander. Up to 104 acres of ponds will be protected and enhanced and up to 72 acres of ponds will be created if all estimated impacts occur (**Tables 4-4, 5-13, and 5-21**).

Similarly, the Implementing Entity will protect and enhance a minimum of 15 acres of wetlands (perennial and seasonal) that either support or have the potential to support breeding California tiger salamanders. Up to 80 acres of wetlands will be protected and enhanced and up to 75 acres of wetlands (perennial and seasonal) will be restored if all estimated impacts occur. As described in the species account in **Appendix D**, seasonal wetlands are more likely to support adequate breeding habitat for California tiger salamander because nonnative predators and hybrid salamanders are less likely to persist in these habitats. However, some perennial wetlands may still support California tiger salamander if they are periodically drained or nonnative predators are controlled in other ways (see the section below for a discussion of management of these ponds and wetlands to support California tiger salamander.)

By the time the Reserve System is fully acquired (which will be at or before Year 45), a minimum of 30% of all ponds and wetlands in the Reserve System will be or will have been occupied by California tiger salamander, as described in the Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Acquisition of Occupied Habitat for Select Wildlife Species*. By Year 30, at least 25% of all ponds and wetlands will be occupied or will have been occupied by the species.

Further, the Implementing Entity will protect grassland, oak woodland, riparian, or chaparral habitat within California tiger salamander modeled habitat (*California tiger salamander*, **Appendix D**) to provide upland refugia for the species. Land acquisition of modeled upland habitat for California tiger salamander will occur in all of the focus areas described below and will be adjacent to modeled breeding habitat. In most cases when modeled breeding habitat is acquired, modeled upland habitat will also be acquired because it will occur on the same parcel.

Land acquisition will substantially benefit California tiger salamander by protecting existing modeled breeding and upland habitat, protecting known occurrences, enhancing habitat through improved management, and providing opportunities for restoration of breeding habitat (freshwater wetlands) and creation of breeding habitat (ponds). To maximize the benefits of acquisition for this species, the Implementing Entity will acquire aquatic and upland modeled habitat in areas adjacent to existing open space with known occurrences of California tiger salamander such as Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, or Henry W. Coe State Park (LAND-WP5).

Portions of the critical habitat units have already been preserved through acquisition and conservation easements (**Figure 4-4**). **Table 5-21** shows that 23% of all critical habitat in the study area is currently protected as Type 1 open space and another 33% is located in space Types 2–4. However, this leaves 41% of critical habitat outside of any type of open space. The Habitat Plan anticipates protecting an estimated 31% of all critical habitat in the study area within the Reserve System, including existing parklands that will be incorporated into the Reserve System. Land acquisition and incorporation of existing open space into the Reserve System will occur in 7 of 8 critical habitat units within the study area<sup>30</sup>, substantially contributing to species recovery in the study area. See Chapter 4, Section 4.7.2 *California Tiger Salamander*, for a discussion regarding the limitations of land acquisition in specific California tiger salamander critical habitat units.

Within the Diablo Range, land acquisition will be focused on protecting the connection between the southern parts of Henry W. Coe State Park, an area with high California tiger salamander densities, to the Soap Lake region in northern San Benito County. Some of the land acquired in this area falls within Critical Habitat Unit 12 and would include up to three known occurrences. Unit 11 is

<sup>30</sup> Subunits EB\_10A and B were counted as one unit. The remaining critical habitat unit in the study area (Unit 9) is almost entirely contained within the Palassou Ridge Open Space (owned by the Open Space Authority) and Coyote Lake-Harvey Bear Ranch County Park.

almost entirely within Henry W. Coe State Park (94%), so the unprotected area may or may not be incorporated into the Reserve System (for this analysis, it is assumed to not be incorporated). Land acquisition will also occur within Unit 7 along lower San Felipe Creek and along Coyote Ridge, protecting up to 7 known occurrences. By bringing most of Joseph D. Grant County Park into the Reserve System (**Table 5-5**), protection and management is enhanced within much of Unit 6 (Grant Park supports up to 14 known occurrences, most of which would be brought into the Reserve System). Another connection will be protected between Alum Rock Park and the Blue Oak Ranch in the northeastern part of the study area (Coyote-7 and Alameda-1). Land acquisition in this area would protect a small portion of Critical Habitat Unit 5 and one known occurrence. Additional populations are likely to be found in this area due to a high density of ponds and a high concentration of known occurrences nearby on existing open space.

The Santa Cruz foothills are another area where acquisition will benefit the California tiger salamander. Though salamander densities are low in the Santa Cruz Mountains when compared to the Diablo Range, protecting the remaining breeding and upland habitat is important in order to retain genetic diversity among the populations in the study area. Retaining connectivity between Uvas Reservoir and Calero County Park would benefit many species, including the California tiger salamander. Acquisitions west of Calero Reservoir will buffer California tiger salamander habitats against urban development in southern San José and also protect the only piece of Critical Habitat Unit 8 that falls outside of Calero County Park. By bringing a portion of Calero County Park into the Reserve System (**Table 5-5**), protection and management is enhanced within the rest of Unit 8. Land acquisition in this area also protects two known occurrences of the species.

Acquisitions targeted north of Gilroy would entirely protect Critical Habitat Unit 10b<sup>31</sup>, including up to three known occurrences. Substantial land acquisition in the Santa Cruz Mountains at the southern end of the study area (Uvas-5 and 6) would protect large stands of annual grassland (i.e., suitable upland habitat), a high density of ponds (i.e., suitable breeding habitat), and up to four known occurrences.

To ensure habitat connectivity within the study area the Implementing Entity will also protect modeled upland habitat between existing ponds and wetlands to provide a linked matrix of pond, wetland, and upland habitat as part of the Reserve System (LAND-G2, LAND-OC1, LAND-OC2, LAND-OC3, LAND-OC4, LAND-OC5). Acquisition will be prioritized to retain or improve habitat connectivity between breeding California tiger salamanders in the Santa Cruz foothills and in the Diablo Range. To accomplish this, the Implementing Entity will acquire land near the Santa Teresa Hills and Tulare Hill as well as areas along the Pajaro River south of Gilroy (LAND-WP7). The Implementing Entity will create at least 20 acres of ponds at 40 locations to increase available habitat and enhance connectivity among existing ponds and wetlands within the Reserve System (POND-9). Pond creation will occur regardless of the level of impacts on

<sup>31</sup> Unit 10a encompasses many small parcels that are not feasible to acquire at this time.

pond habitat. The purpose is to contribute to the recovery of the California tiger salamander in the study area. In addition to this pond creation the Implementing Entity will create ponds lost to covered activities, in-kind within the Reserve System, at a ratio of 1-acre of conservation to 1-acre of impact (1:1) (estimated to be 52 acres) (POND-10). An estimated 72 acres of ponds will be created to mitigate this impact (**Tables 5-13 and 5-21**). The total allowable impact on California tiger salamander modeled breeding habitat during the permit term is 77 acres of permanent impacts and 14 acres of temporary impacts, for a total of 91 acres (**Table 4-4**). To offset these impacts, a minimum of 195 acres of modeled breeding habitat will be protected and managed as part of the Reserve System to offset these impacts (**Table 5-17**). To achieve the biological goal for the California tiger salamander, acquisition of wetlands and ponds will be prioritized by: (1) sites with documented records of breeding California tiger salamander, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of California tiger salamander but with pond turtle habitat and known occurrences of other covered species.

Within the Reserve System the Implementing Entity will restore 20 acres of perennial wetlands and create 20 acres of ponds (in 40 locations) (**Tables 5-13 and 5-21**) in areas within the typical dispersal distance of known breeding sites to create new breeding opportunities for this species (POND-7, POND-8, POND-9) (**Appendix D**). These wetlands and ponds will contribute to the recovery of the species while additional wetlands and ponds will be created to replace those lost to covered activities. See Section 5.3.7 *Wetland and Pond Conservation and Management* for details on restoration. This will further serve to reduce habitat fragmentation and promote genetic exchange within the population. The locations selected for wetland restoration and pond creation will be determined on the basis of physical processes, including hydrologic, geomorphic, and soil conditions to ensure that successful restoration or creation can occur and be self-sustained.

## Management Techniques and Tools

In order to increase the habitat quality of modeled upland habitat the Implementing Entity will continue or introduce livestock grazing within grassland communities in the Reserve System in a variety of grazing regimes (GRASS-1, LM-11). Other techniques that will be employed to reduce nonnative vegetation and increase the quality of upland habitat for California tiger salamander include prescribed burns (GRASS-2) and the selective application of herbicides or other treatments (e.g., hand or mechanical removal) to reduce the biomass of nonnative vegetation and increase the success of native vegetation (LM-14). To further increase the quality of modeled upland habitat, native grasses will be planted around the perimeter of ponds and wetlands (POND-3).

Fencing that allows for covered species passage will be installed on portions of ponds and wetlands to reduce grazing pressure and feral pig access to provide vegetated refuge sites for native amphibians (POND-1). If entire ponds or wetlands need to be fenced, alternate water sources will be provided for livestock. These fences will also serve to protect breeding habitat from



destruction from feral pigs. Additional measures will be implemented like trapping, hunting or other control methods, to reduce the feral-pig when feral pigs are hindering the Implementing Entity's ability to achieve the biological goals and objectives of the Plan (LM-12).

The Implementing Entity will increase the quality of modeled breeding habitat within the permit area by periodically clearing vegetation or removing sediment (POND-4) to create a variety of microhabitats within a single pond or wetland. This will provide shallow areas for California tiger salamander larvae while also accommodating other native aquatic species (POND-13). The Implementing Entity will also reduce nonnative predators (bullfrogs, invasive fish). It will use a variety of management techniques, which include habitat manipulation (e.g., periodic draining of ponds and other wetlands), trapping, hand capturing, and electroshocking to reduce nonnative predator populations (LM-13). Other techniques may be employed upon the approval of the USFWS and CDFG. New ponds will be designed to rely on passive management (e.g., dry on their own periodically), minimizing the need for artificial draining, or minimal management (e.g., stock pond dams fitted with drainage structures).

## Threats and Uncertainties

Although expected, it is uncertain whether acquiring and managing land to favor California tiger salamander will ultimately result in the species expanding its range within the study area. One limiting factor might be the presence of fossorial rodents (e.g., California ground squirrels) in upland habitats. California tiger salamanders depend on the underground refugia provided by these burrowing mammals, and without them, upland habitats are less suitable. In general, where burrowing rodents are lacking in the ecosystem it is due to human-caused eradication, but in some cases other environmental factors may influence whether fossorial rodents are present (e.g., soil, slope, water table). In addition, there may be cases where a portion of potential upland habitat is in a parcel adjacent to an acquired parcel containing potential breeding habitat. These factors will be considered when adding lands to the Reserve System to contribute to the recovery of California tiger salamander.

Since this Plan will both increase the connectivity between breeding sites and increase the frequency of surveys in the permit area it also has the potential to facilitate the spread of detrimental environmental factors (e.g., chytrid fungus, nonnative predators). To minimize this impact, Condition 4, *Stream Avoidance and Minimization for In-Stream Projects*, and Condition 12, *Wetland and Pond Avoidance and Minimization*, outline measures to be used by anyone working or studying in aquatic habitats. If ponds, wetlands, and the native amphibian populations that they support, become infected with chytrid fungus or other diseases, the Implementing Entity will use the best scientific information available to manage and stop the spread of the epidemic (STUDIES-7). Further, the Implementing Entity will conduct a risk assessment, using the best information available, when siting California tiger salamander breeding habitat to determine the risk of increasing the nonnative predator population (i.e., potential of bullfrog colonization of the new breeding site).

## Hybridization with Nonnative Salamanders

Barred salamander (*Ambystoma tigrinum mavortium*) is native to parts of Texas, eastern New Mexico, Oklahoma, Kansas, Nebraska, eastern Wyoming, and Colorado. It has been found in isolated locations throughout much of California, including Santa Clara County. The barred salamander is much larger than the California tiger salamander (it is the second largest salamander in the United States) and exhibits different behavior and life-history traits than the California tiger salamander. Native California tiger salamanders and introduced barred tiger salamanders are capable of inter-breeding (hybridizing) and have been hybridizing for 50–60 years (Fitzpatrick and Shaffer 2007). This hybridization is a major threat to California tiger salamanders.

Barred tiger salamander adults retain juvenile traits such as gills when they breed in aquatic habitats. These individuals, called “paedomorphs,” provide the opportunity to readily distinguish barred salamanders and hybrids from native California tiger salamanders in breeding ponds and wetlands. Hybridization and introgression between the California tiger salamander and the barred tiger salamander is most likely occurring at many breeding sites throughout Santa Clara County, especially in the southern portion of the county (e.g., Bluestone Lake, North Fork Pacheco Creek) at areas located within close proximity to introduction sites (**Appendix K** *California Tiger Salamander Hybridization*).

**Appendix K** provides a management, monitoring, and adaptive management strategy for California tiger salamanders and hybrids. Key components of the strategy include management, public education, outreach, and targeted studies in close coordination with the Wildlife Agencies.

The initial management strategy for hybrids will focus on restoring and maintaining wetland and pond conditions within the Reserve System that favor California tiger salamanders. Perennial breeding sites studied in the hybrid zone often contained paedomorphic tiger salamanders, relative to more seasonal aquatic sites like vernal pools (Fitzpatrick and Shaffer 2004). Therefore, initial restoration actions will target sites where paedomorphs have been observed because presence of paedomorphs would indicate presence of nonnative alleles in the tiger salamander population. Since different individual tiger salamanders are expected to return to breeding ponds every year, these targeted perennial ponds will be periodically drained to control nonnative introductions. The adaptive management process will be used to adjust monitoring and management as described in **Appendix K**.

New nonnative salamander introductions are caused by humans, and therefore could be decreased with a public education campaign. Public education will be conducted to inform the public that the use of any salamander as bait in the State of California is illegal (POND-12). The Implementing Entity will also conduct education and outreach to pond landowners, provide technical assistance, and offer financial and regulatory (Safe Harbor Agreement) incentives to private landowners to restore, create, and maintain breeding habitat conditions on their land that favor native California tiger salamanders (POND-11). Finally, the Plan will contribute toward research to determine the distribution of, and ecological

effects resulting from, introgression and interbreeding of native and nonnative tiger salamanders (e.g., effects due to competition [lower growth rates, adult survival]; effects due to predation; effects due to reduced fitness of hybrids) and effect on covered amphibians and reptiles (STUDIES-8). These studies will be coordinated with, and be complementary to, similar studies conducted outside of the purview of this Plan. With Wildlife Agency approval, the Implementing Entity will incorporate specific management prescriptions supported by this research, and research conducted by others, in the applicable reserve unit management plans.

### 5.4.3 California Red-Legged Frog

#### Biological Goals and Objectives

The Implementing Entity will support viable populations and contribute to the regional recovery of the California red-legged frogs by increasing the number of individuals and expanding the distribution of this species within the Reserve System. This will be accomplished by protecting land through fee title purchase or by obtaining easements that are managed as part of the Reserve System.

Within the Reserve System the amount and quality of California red-legged frog habitat will be increased and improved through restoration, enhancement and creation of breeding and upland habitat. The Reserve System will be designed to maintain connectivity between breeding habitat and upland habitat and to provide essential short-term upland refugia as well as dispersal habitat by protecting landcover types that provide breeding habitat like ponds and wetlands and upland refugia and dispersal habitat like grassland, oak woodland, riparian, or chaparral. Acquisition, enhancement, and restoration/creation conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*), oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and wetlands and ponds (see Section 5.3.7 *Wetland and Pond Conservation and Management*) will benefit California red-legged frog through upland, movement, breeding, foraging and year-round habitat conservation and management.

In addition, the Reserve System will link California red-legged frog habitat within the study to areas important to the species outside of the study area, like San Francisco Public Utilities Commission Alameda Watershed properties in Santa Clara and Alameda counties and the Soap Lake region in San Benito County.

## Habitat Acquisition, Restoration, and Creation

There are 341,773 acres of California red-legged frog modeled habitat (primary and secondary habitat) within the study area. A total of 101,164 acres (30%) of that modeled habitat are located in Type 1, 2, or 3 open space with 46,253 acres (14%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 31,300 acres of modeled habitat for the Reserve System. In addition, 11,930 acres of modeled habitat for California red-legged frog will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected habitat in the study area to about 26% in Type 1 open space and 39% in Type 1, 2, and 3 open space (**Table 5-17**). The Reserve System will include 1,430 acres of modeled primary habitat and 41,800 acres of modeled secondary habitat.

The Implementing Entity will protect (through acquisition or easement) and enhance a minimum of 50 acres of ponds that support or have the potential to support breeding California red-legged frogs. In addition, a minimum of 20 acres of ponds will be created to support aquatic covered species and tri-colored blackbird. Up to 104 acres of ponds will be protected and enhanced and up to 72 acres of ponds will be created if all estimated impacts occur (**Tables 5-13 and 5-21**). Similarly, the Implementing Entity will protect and enhance a minimum of 10 acres of perennial wetlands and up to 50 acres of perennial wetlands that either support or have the potential to support aquatic covered species and tri-colored blackbird. A minimum of 20 acres of perennial wetlands will be restored to support aquatic covered species and tri-colored blackbird. Up to 45 acres of perennial wetlands will be restored if all estimated impacts occur. In addition, a minimum of 100 miles of streams will be protected that either support or have the potential to support breeding California red-legged frogs, breeding foothill yellow-legged frogs, and/or foraging/basking western pond turtles. A minimum of 1 mile of streams will be restored that have the potential to support these same species. Up to 10.4 miles of streams will be restored if all estimated impacts occur. Further, it will protect grassland, oak woodland, riparian, or chaparral habitat within the California red-legged frog modeled habitat (*California red-legged frog*, **Appendix D**) to provide upland refugia and dispersal opportunities for the species. To maximize benefits to the species the Implementing Entity will target acquisitions in the East San Francisco Bay Recovery Unit (U.S. Fish and Wildlife Service 2002) (LAND-WP4) and in areas adjacent to existing open space with known occurrences of California red-legged frog, such as Joseph D. Grant County Park or Palassou Ridge Open Space Preserve (LAND-WP5).

In the Diablo Range, land will be acquired along Coyote Ridge to ensure that an area with high concentrations of California red-legged frogs is protected. Up to 15 known occurrences (breeding sites or movement locations) on Coyote Ridge could be preserved. The Implementing Entity will also target acquisition of parcels northeast of Alum Rock Park to connect Alum Rock Park and Cherry Flat Reservoir (Alameda-1 and Coyote-7) with protected open space outside the study area (i.e., San Francisco Public Utilities Commission Alameda Watershed). This will also protect suitable habitat for this species and up to one known occurrence in Critical Habitat Units STC-1 and STC-2 (75 FR 12815 12959). Incorporation of most of Joseph Grant County Park into the Reserve System will provide

substantial opportunity to enhance suitable and occupied breeding habitat (**Table 5-5**). The portion of Grant Park proposed for the Reserve System supports at least two known occurrences of the species.

Portions of the critical habitat units have already been preserved through acquisition and conservation easements (**Figure 4-5**). **Table 5-21** shows that 24% of all critical habitat in the study area is currently protected as Type 1 open space and another 14% is located in open space Types 2–4. However, this leaves 62% of critical habitat outside of any type of open space. The Habitat Plan anticipates protecting an estimated 14% of all critical habitat in the study area within the Reserve System, including existing parklands that will be incorporated into the Reserve System.

Additional target areas of land acquisition that will benefit this species and support implementation of the Recovery Plan include the area between Henry W. Coe State Park and the Soap Lake region of San Benito County (LAND-WP5). This area is important for many covered species and will help retain a connection between breeding populations in the state park and in areas outside of the study area. Although there are no known occurrences in this area due to a lack of survey effort, there is a high density of ponds, many of which are expected to be suitable breeding habitat.

Land acquisition in the Pacheco Watershed will protect high densities of suitable ponds and other wetlands, including up to three known occurrences of California red-legged frogs. Protection of the creek and the associated riparian areas will increase the level of protection of breeding and movement habitat in this part of the study area. Further, this area likely provides an important movement corridor between the Soap Lake region of San Benito County to areas northeast in Santa Clara County such as Romero Ranch and Pacheco State Park.

By the time the Reserve System is fully acquired (which will be at or before Year 45), a minimum of 40% of all ponds and wetlands in each of the federal Recovery Units 4 and 6 in the Reserve System will be or will have been occupied by California red-legged frog, as described in the Section 5.3.1 *Land Acquisition and restoration Actions* subheading *Acquisition of Occupied Habitat for Select Wildlife Species*. By Year 30, at least 35% of all ponds and wetlands in each of the federal Recovery Units 4 and 6 will be occupied or will have been occupied by the species.

There is no designated critical habitat for California red-legged frog in the Santa Cruz Mountains. However, land acquisition in this area will protect a substantial amount of suitable breeding, aestivation, and movement habitat. For example, land acquisition around Calero Lake, Chesbro Reservoir, and Uvas Reservoir will protect suitable habitat, some of which is within a mile of known occurrences. Land acquisition in the south end of the study area will protect up to four known occurrences and a high density of ponds and other wetlands suitable for California red-legged frog breeding.

To achieve the biological goal for the California red-legged frog, acquisition of wetlands, ponds, and streams will be prioritized by: (1) sites with documented

records of breeding California red-legged frog, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of California red-legged frogs but with pond turtle habitat and known occurrences of other covered species.

The Implementing Entity will create at least 20 acres of ponds at 40 locations to increase available habitat and enhance connectivity among existing ponds and wetlands within the Reserve System (POND-9). Pond creation will occur regardless of the level of impacts on pond habitat by covered activities. The purpose of this habitat creation is to contribute to the recovery of the California red-legged frog in the study area. In addition to pond creation the Implementing Entity will create ponds lost to covered activities, in-kind within the Reserve System, at a ratio of 1-acre of creation to 1-acre of impact (1:1) (estimated to be 52 acres) (POND-10). Together with the minimum creation requirements, up to 72 acres of ponds (minimum of 20 acres plus 52 acres to offset impacts) will be created within the Reserve System (**Tables 5-13 and 5-21**).

The Implementing Entity will also restore at least 20 acres of perennial wetlands within the Reserve System. All of this will be characterized as coastal and valley freshwater marsh (POND-6) and will be restored regardless of the level of impacts to wetlands in the study area from covered activities. In addition to those 20 acres, the Implementing Entity will restore impacted perennial freshwater wetlands “in-kind” at a ratio of one-acre of conservation to one-acre of impact (1:1) (POND-7) (estimated to be 25 acres). The Implementing Entity will also restore impacted seasonal wetlands “in-kind” at a ratio of two-acres of conservation to one-acre of impact (2:1) (POND-8) (estimated to be 30 acres). Restoration will be carried out in areas that will increase available habitat and enhance connectivity among existing ponds and wetlands within the Reserve System.

## Management Techniques and Tools

Since the California red-legged frog utilizes pond and wetland habitats, as well as riverine habitats within the study area, management actions that enhance and restore those natural communities will benefit this species. In addition, many of the management actions outlined for the California tiger salamander will benefit the California red-legged frog. For a description of the management techniques that will be implemented to increase the quality and quantity of California red-legged frog habitat within the Reserve System refer to Section 5.4.2, *California Tiger Salamander* subheading *Management Techniques and Tools*, above. In addition, the Implementing Entity may utilize translocation of California red-legged frog to help establish new populations in the study area. This activity will only be undertaken with the approval of the Wildlife Agencies, and when biologically appropriate and necessary to meet biological goals and objectives of the Plan.

For a general description of pond, wetland, and riverine restoration, creation, and management refer to Sections 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management* and 5.3.7 *Wetland and Pond Conservation and*

*Management*, above. All management actions in this Plan are consistent with management guidelines in the species' Recovery Plan (U.S. Fish and Wildlife Service 2002).

## Uncertainties and Threats

Since this Plan will both increase the connectivity between breeding sites and increase the frequency of surveys in the permit area it also has the potential to facilitate the spread of detrimental environmental factors (e.g., chytrid fungus, nonnative predators). If ponds, wetlands, and the native amphibian populations that they support, become infected with chytrid fungus or other diseases, the Implementing Entity will use the best scientific information available to manage and stop the spread of the epidemic (STUDIES-7). Further, the Implementing Entity will use the best information available to determine whether the benefits of creating more California red-legged frog breeding habitat in an area outweighs the risk of increasing the nonnative predator (i.e., bullfrogs) population along with it.

### 5.4.4 Foothill Yellow-Legged Frog

#### Biological Goals and Objectives

The goal of the Implementing Entity will be to maintain or increase the population of foothill yellow-legged frog in the study area. The objectives toward meeting that goal are to acquire, through fee title or conservation easement, streams that have or historically had perennial flows. Additionally, the Implementing Entity will enhance or restore perennial streams to provide higher quality habitat for all riverine species, including foothill yellow-legged frog. Acquisition, enhancement, and restoration/creation conservation actions identified for streams and riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and redwood forests (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*) will benefit foothill yellow-legged frog through movement, foraging, and year-round habitat conservation and management.

#### Acquisition, Restoration, and Enhancement

There are 690 miles of foothill yellow-legged frog modeled primary and secondary habitat within the study area. A total of 222 stream miles (32%) of modeled primary and secondary habitat are located on Type 1, 2, or 3 open space with 119 stream miles (17%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 80 miles of primary and secondary modeled habitat for the Reserve System. In addition, 24 miles of primary and secondary modeled habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of total

protected primary and secondary modeled habitat in the study area to about 32% in Type 1 open space and 44% in Type 1, 2, or 3 open space (**Table 5-17**).

The Implementing Entity will target acquisition of streams that currently have, or historically had, perennial flows and cobblestone substrate (LAND-R5) along with intermittent and ephemeral streams that connect to those perennial streams. A recent study in Tehama County has revealed that foothill yellow-legged frogs utilize perennial systems primarily but also use associated intermittent and ephemeral streams within the same watershed (Bourque 2008). These stream reaches will be located along:

- Uvas/Carnadero Creek above Uvas Reservoir,
- small creeks above Calero Reservoir,
- Alamitos and Guadalupe Creeks upstream and outside of urban San José,
- Llagas Creek above Chesbro Reservoir,
- San Felipe Creek, above Anderson Reservoir,
- Uvas Creek below Uvas Reservoir,
- Little Arthur Creek,
- Upper Penitencia Creek.

Occupied habitat for foothill yellow-legged frog will be protected in the Reserve System in at least four of the watersheds in **Figure 3-6**, in both the Diablo Range and in the Santa Cruz Mountains (as described in the Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Acquisition of Occupied Habitat for Select Wildlife Species*). The Reserve System is expected to protect at least four known occurrences of the species, three on Llagas Creek above Chesbro Reservoir, and one on San Felipe Creek above Anderson Reservoir. Additional occurrences may be found in the Reserve System on Upper Penitencia Creek, Uvas Creek below Uvas Reservoir, and Little Arthur Creek due to their proximity to known occurrences in the same stream systems and the lack of survey effort for the species in those areas. To achieve the biological goal for the foothill yellow-legged frog, acquisition of streams will be prioritized by: (1) sites with documented records of breeding foothill yellow-legged frog, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of foothill yellow-legged frogs but with pond turtle habitat and known occurrences of other covered amphibian species.

The Implementing Entity will restore a minimum of 1 mile of stream to support breeding yellow-legged frogs, breeding California red-legged frogs, and/or foraging/basking western pond turtles regardless of the level of impact (**Table 5-13**). Up to 10.4 miles of stream will be restored if all estimated impacts occur (**Table 5-13**). This could include the perennial stream reaches mentioned above. For foothill yellow-legged frogs this restoration will involve adding sufficient sediment to stream courses so that sand bars will form to create egg laying substrate, or adding large rocks to the stream course for the same purpose. Management will include selectively applying herbicides or other treatments to



control nonnative invasive vegetation along creek corridors (LM-14) that might inhibit sediment movement and restrict the creation of egg laying habitat.

## Management Techniques and Tools

Foothill yellow-legged frogs require streams with fast moving water and cobblestone substrate. Channel rehabilitation will increase the amount of this type of habitat that is available in the study area. The Implementing Entity will replace concrete, earthen or other engineered channels to restore floodplain connectivity (STREAM-4, STREAM-5). This gives the frog some areas of slower flow or other a natural habitats adjacent to the stream, in which to take refuge during high water. It also allows the streams to form gravel bars, behind which this species often lays eggs. To further enhance these rehabilitated channels the Implementing Entity will plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature (STREAM-2). This can be done in other reaches as well, where there is an unnatural void in riparian vegetation. In all streams mentioned above there will be opportunities to increase the amount of cobblestone substrate by actually adding rocky substrate to the stream channel (STREAM-8). Gravel augmentation will avoid the breeding season. This management action will be applied to areas close to known occurrence(s) of foothill yellow-legged frog or immediately upstream or downstream of known occurrences or other high quality foothill yellow-legged frog breeding habitat.

The Implementing Entity may utilize translocation of foothill yellow-legged frog to help establish new populations in the study area. This activity will only be undertaken with the approval of the Wildlife Agencies, and when biologically appropriate and necessary to meet biological goals and objectives of the Plan.

## Threats and Uncertainties

The biggest threat to foothill yellow-legged frog is continued alteration of the hydroperiod of streams within the study area. Managing for this species downstream of reservoirs in northern watersheds is difficult because flows are controlled as part of a water delivery system to the City of San José. Restoration and management efforts will always be subject to whether there is enough water to support perennial flows in these watersheds. In the southern watershed there are fewer limitations on how and when the water is released out of reservoirs. Still managing riverine systems downstream of reservoirs is not a guaranteed solution every year. Augmenting streams with cobblestone substrate to increase the amount of breeding habitat for this species is a short-term solution unless accompanied by complimentary land management practices upstream that can sustain the flows and sediment delivery. If there are uncontrolled sources of sediment upstream then the habitat quality will continue to be diminished, eggs could be silted in, or egg laying habitat could be removed as the stream changes course in reaction to high sediment deposition. If the stream is not in a relatively

natural condition then flows during high water events will continue to degrade the habitat even after cobblestone substrate is added.

Global climate change could impact this species through changes in the amount of precipitation and therefore the amount of surface water in occupied streams. Areas that receive less rainfall will support less high-quality habitat for foothill yellow-legged frog in the future. One benefit of the Reserve System is that species will have more ability to move away from areas that are less suitable and into areas that are more suitable over the long-term. Protecting small, isolated breeding locations for this species might not adequately protect the species over the long term if rainfall patterns change stream hydrology.

Watersheds with a high level of agricultural production were associated with the decline of the species, due to airborne agro-chemicals (Lind 2005). In general, the Reserve System is far from agricultural production that uses pesticides, raising the chance of achieving the biological goals and objectives for this species.

## 5.4.5 Western Pond Turtle

### Biological Goals and Objectives

The Implementing Entity will support viable populations and contribute to the regional recovery of the western pond turtle by maintaining or increasing the number of individuals and expanding the distribution of this species within the Reserve System. This will be accomplished by protecting land through fee title purchase or by obtaining easements that are managed as part of the Reserve System. Within the Reserve System the amount and quality of western pond turtle habitat will be increased and improved through restoration, enhancement, and creation of basking habitat and breeding sites. Acquisition, enhancement, and restoration/creation conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*), oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and wetlands and ponds (see Section 5.3.7 *Wetland and Pond Conservation and Management*) will benefit western pond turtle through movement, breeding, foraging and year-round habitat conservation and management.

### Habitat Acquisition, Restoration, and Creation

There are 314,916 acres of western pond turtle modeled habitat (primary and secondary) within the study area. A total of 98,060 acres (31%) of that modeled habitat are located in Type 1, 2, or 3 open space with 44,967 acres (14%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 27,000 acres of modeled habitat for the Reserve System. In

addition, 11,900 acres of modeled habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area to about 27% in Type 1 open space and about 40% in Type 1, 2, or 3 open space (**Table 5-17**).

The Implementing Entity will protect, through acquisition or easement, and enhance a minimum of 50 acres of ponds, 10 acres perennial freshwater wetlands, and 100 miles of stream that either support or have the potential to support covered aquatic species, including western pond turtle. Up to 104 acres of ponds and 50 acres of perennial freshwater wetlands will be protected and enhanced if all estimated impacts (LAND-WP2a, LAND-WP2b, LAND-WP3a, LAND-WP3b, LAND-WP6a, LAND-WP6b). To achieve the biological goal for the western pond turtle, acquisition of wetlands, ponds, and streams will be prioritized by: (1) sites with documented records of breeding western pond turtles, (2) sites with known occurrences, though not necessarily breeding, and (3) sites without known occurrences of western pond turtle but with pond turtle habitat and known occurrences of other covered species. Most of the land acquisition that will benefit western pond turtle will occur along the Pacheco Creek riparian corridor and between Henry W. Coe State Park and the Soap Lake region of San Benito County. Additional acquisitions west of Chesbro reservoir and west and east of Calero Reservoir will also benefit this species, where both ponds will be acquired as well as perennial reaches of streams.

During the course of Plan implementation, the Implementing Entity will protect and enhance a minimum of 100 miles of streams and 250 acres of riparian forest and scrub to benefit aquatic covered species and least Bell's vireo. Up to 592 acres of riparian forest and scrub (including California alluvial sycamore woodland) will be protected and enhanced if all estimated impacts occur. In addition, a minimum of 1 mile of stream and 50 acres of riparian forest and scrub (including California alluvial sycamore woodland) will be restored. Up to 10.4 miles of streams and 353 acres of riparian forest and scrub will be restored if all estimated impacts occur (STREAM-4, STREAM-5).

Ponds that are lost to covered activities will be created at a ratio of 1:1 (estimated at 52 acres) within the Reserve System in (POND-10) (**Table 5-12**). In addition, the Implementing Entity will create a minimum of 20 acres of new ponds at approximately 40 locations to create new breeding opportunities for aquatic covered species and tri-colored blackbird (POND-9). The intent of these new ponds is to contribute to the recovery of the species beyond the replacement of pond habitat lost to covered activities.

By the time the Reserve System is fully acquired (which will be at or before Year 45), a minimum of 25% of all ponds and wetlands in the Reserve System will be or will have been occupied by western pond turtle, as described in the Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Acquisition of Occupied Habitat for Select Wildlife Species*. By Year 30, at least 20% of all ponds and wetlands will be occupied or will have been occupied by the species.

## Management Techniques and Tools

For a detailed discussion of the management techniques that will be implemented to increase the quality and quantity of western pond turtle habitat within the study area refer to Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation Management* and Section 5.3.7 *Wetland and Pond Conservation Management*.

In addition, the Implementing Entity will install artificial basking substrate and add woody debris to ponds that otherwise lack suitable basking sites to enhance habitat for western pond turtles (POND-2). Woody debris and artificial basking substrate enhance habitat by providing areas for turtles to thermoregulate, an essential biological function. Basking platforms might also be used when natural debris is not suitable. Basking platforms differ from woody debris in that they can be anchored, are durable, and will not be submerged by rising water levels. The basking platforms and added woody debris will also facilitate species-level monitoring by providing a consistent and stable point at which to count pond turtles. Populations of nonnative competitors such as red-eared sliders will also be reduced (Objective 19.3).

The Implementing Entity may utilize translocation of western pond turtle to help establish new populations in the study area. This activity will only be undertaken with the approval of the Wildlife Agencies, and when biologically appropriate and necessary to meet biological goals and objectives of the Plan.

## Threats and Uncertainties

A lack of nesting sites is likely the limiting factor for this species in the study area. Identifying and protecting potential nesting habitat is important to ensure recruitment of juveniles into the population (STUDIES-9). In order to accomplish that, the Implementing Entity will focus on protecting buffers around aquatic habitats that might support nesting pond turtles. That in turn should increase the productivity of this species during the permit term, though there is some uncertainty that an increase in productivity will occur. Continued alteration of streams and wetlands and continued disconnection of streams and their floodplains is the greatest threat to pond turtles. Adequate time will be given to determine whether newly created habitat is successfully replacing habitat that is lost to covered activities.

### 5.4.6 Western Burrowing Owl

A complete conservation strategy for western burrowing owl, including background information, conservation region descriptions, and expanded biological goals and objectives discussion, is provided as **Appendix M, *Western Burrowing Owl Conservation Strategy***. A summary of this strategy is provided below. Because of the unique nature of the conservation strategy for this species,

this section is organized differently than the rest of the covered species sections in this chapter.

## Background

Nesting burrowing owls in the greater San Francisco Bay Area, and the South Bay area in particular, are a dwindling resource. In the early 1990s there were an estimated 150–170 breeding pairs in the San Francisco Bay Area (DeSante and Ruhlen 1995; DeSante et al. 1993). It was estimated that these numbers represented a 53% decline from the previous census period of 1986–1990 (DeSante et al. 1997) and more recent numbers indicate that, if anything, the downward trend is increasing. In those estimates it was assumed that 75% of the San Francisco Bay Area burrowing owl population occurred in Santa Clara County and nearly all of those owls were congregated around the southern edge of the San Francisco Bay (DeSante et al. 1997). Surveys in the early 1990s revealed that about a third (43–47 pairs) of Santa Clara County breeding pairs occurred inside what is now the Santa Clara Valley Habitat Plan study area (Albion Environmental Inc. 2000).

## Overview of Burrowing Owl Conservation Strategy

The Plan proposes to undertake an aggressive suite of measures aimed at reversing the declining trend of the burrowing owl population in Santa Clara County. The goal of the Plan is to establish a burrowing owl population in the study area and the expanded study area (**Figure 5-10**) that is first stable, then increasing over time, while accounting for normal fluctuations in population levels. The general approach will be to increase the numbers, distribution, and connectivity of burrowing owl colonies in the permit area. This will be accomplished by using a phased conservation approach, initially focusing efforts on areas within immediate flight distance from known colonies while gathering data to inform future efforts. Later phases, triggered as more resources are available and in response to initial results, will focus on lands further out to allow for growth in both numbers and range. Initial techniques will include data gathering and analysis to inform management decisions, utilizing current best management practices, testing newly proposed management techniques through pilot scientific studies, acquisition of existing and potential breeding and foraging areas, management (both permanent and temporary agreements) of burrowing owl habitat and, and population augmentation.

These measures will be applied in four burrowing owl conservation regions: North San José/Baylands, South San José, Morgan Hill, and Gilroy (**Figure 5-10**). Opportunities to conduct meaningful burrowing owl conservation inside the Habitat Plan study area are limited because the most effective conservation measures must take place in near proximity to the remaining burrowing owl occurrences. Since those occurrences are clustered around the southern part of the Bay and northern San José, there is little unused land available and that which is not built on has high land values. As a result the conservation focus for

burrowing owls was expanded to include the entire Baylands region, in addition to the Habitat Plan study area (**Figure 5-10**).

Acquisition and permanent protection of land is generally infeasible in the areas most valuable for this species because of the limited availability of land and its high cost. What land is available and likely most suitable for the species is already publically owned. Therefore, to ensure enhanced management on sites to support the species and meet population growth goals, the Implementing Entity will either acquire in fee title, secure conservation easements, or secure management agreements. At least initially, limited burrowing owl habitat acquisition and/or management will occur along the southern edge of the study area and more limited conservation activities will occur in the two middle regions because of the current lack of occupied nesting burrowing owl colonies in these areas (**Figure 5-10**). If conservation actions in the North San José/Baylands region prove successful, it is reasonable to assume the nesting burrowing owl population will expand into suitable habitat in the South San José, Morgan Hill, and Gilroy regions. Management of overwintering habitat will also occur in the Reserve System.

Conservation targets for western burrowing owl that are based on habitat availability (similar to what was done for other covered wildlife species) are likely to be inadequate to ensure population recovery in the study area because of the relatively low existing population size. Instead, conservation targets for population size were developed. These population targets were then used to develop targets for the amount of habitat needed to support that population.

To determine the population target needed for burrowing owls in the Plan, a count-based population viability analysis (PVA) was used. This analysis was used to determine the probability of persistence of three burrowing owl nest colonies in the South Bay. This analysis was performed on the three largest remaining burrowing owl colonies in the South Bay Area (Moffett Airfield, San José International Airport, and Shoreline at Mountain View) using survey data of adult burrowing owls from the 11-year period of 1999–2009. These sites were chosen because they are the primary remaining population clusters and because data was available for the period of time recommended for the analysis (i.e., at least 10 years). The intent of the analysis was to quantify population size, trend, growth rate, and variance in the three burrowing owl colonies and to evaluate the probability of persistence of these colonies (individually and combined) during that 11-year period. It was assumed that the population performance at these three sites can be used as an index for population performance for burrowing owls in the Habitat Plan study area.

In order to develop a burrowing owl population size goal for the Habitat Plan, the annual population size of adult owls was artificially increased in a statistical model to determine the rate at which the numbers of adult burrowing owls at the three baseline colonies (San José International Airport, Moffett and Shoreline) would need to increase and over what period of time to change the PVA probability of extinction trend from a negative growth rate to a positive growth rate. It was determined that if currently measured population characteristics held true (i.e., growth rate and variance were constant) changing the overall number of

adult burrowing owls in this type of model did not change the probability of persistence significantly (**Appendix N**). Instead, increasing the change of population persistence was best achieved by a steady increase in the number of adult burrowing owls. Therefore, for the purposes of this Plan, growth rate is a more correct predictor of persistence than an ultimate population size.

During 2009, there were 51 adult burrowing owls observed at the three reference nest colonies. Based on these numbers and the PVA, it was determined that in order to change the population trend in the South Bay from negative to positive within a 10-year time period, there would have to be an increase of three adult owls per year. A period of at least 10 years is also needed to allow time for collection of data at occupied nest sites in the permit area and integration of that data into the PVA model. To account for these factors and to provide additional time to achieve the population targets, the Plan has a goal to achieve a positive growth rate in the burrowing owl population in South Bay Population by Year 15.

The total population of burrowing owls in the South Bay is estimated at 70 adults (51 adults at the three reference sites plus 19 adults observed in 2008 in other parts of the study area). If three burrowing owls were recruited to the population every year for the permit term, an additional 150 adults would be added, for a total population size of 220 adults. The Habitat Plan would be responsible for 70% of this population growth (154 adults at the end of the permit term) based on its proportion of the South Bay and burrowing owl population. This equates to a land management need of 5,300 acres of occupied or potential nesting habitat (see **Appendix M** for calculations) in the permit area. Of the 5,300 acres, a minimum of 600 acres of occupied nesting habitat will be protected in fee title or conservation easement. Similar to the conservation strategy for other covered species, these lands will be under permanent management agreements administered by the Implementing Entity no later than Year 45. The Plan also provides a species-specific Stay-Ahead provision for the burrowing owl (see Section 8.6.1). Priority will be given towards management on occupied habitat (**Figure 5-11**), followed by potential nesting habitat (see Chapter 4, Section 4.6.4 *Western Burrowing Owl* for habitat definitions).

Specific burrowing owl conservation actions that would occur on the 5,300 acres of occupied and potential nesting habitat are grouped into three “tiers” of priority:

- **Tier 1 conservation actions** are designed to stabilize the existing population by protecting and/or managing occupied burrowing owl nesting habitat. Tier 1 actions may indirectly increase the numbers of owls in extant colonies. Tier 1 conservation actions will take place initially in the North San José/Baylands Region where owls currently occur. Tier 1 conservation actions will occur immediately upon Plan implementation.
- **Tier 2 conservation actions** are designed to facilitate growth and expansion of existing colonies, the number of colonies, and the range of the species in the permit area by managing potential burrowing owl nesting habitat in all portions of the permit area. Tier 2 conservation actions will also take place

immediately and will initially be implemented in the North San José/Baylands Region where owls currently occur.

- **Tier 3 conservation actions** consist of more experimental and active methodologies such as population augmentation and owl relocation within the permit area to increase owl numbers and expand distribution. Tier 3 actions will be implemented in response to population performance at the three index sites (Shoreline Park in Mountain View, San José International Airport, and Moffett Federal Airfield) but these actions could occur in any of the burrowing owl conservation regions. These actions will be coordinated with the Wildlife Agencies and will only be implemented upon their approval. Upon approval, these actions could occur immediately upon implementation of the Plan and are not dependent upon the grant awards.

**Appendix M** describes the specific conservation actions proposed for the western burrowing owl conservation strategy. Examples include:

- Protect existing colonies through fee title acquisition, purchase of a conservation easement, or management agreements (Tier 1).
- Increase survival rates at existing nest colonies through focused management actions (Tier 1).
- Survey all undeveloped parcels within 7.5-miles of documented nest colonies and complete an opportunities and constraints assessment of each for the potential of the site to function as a burrowing owl reserve (Tier 2).
- Employ population augmentation techniques to increase the local population size (Tier 3).

## Biological Goals and Objectives

The Implementing Entity will work to increase the size and sustainability of the breeding and overwintering burrowing owl population and increase the distribution of breeding and overwintering burrowing owls in the permit area (**Figure 5-10**). This goal will be met by achieving a positive growth rate by Year 15 of the Plan using annual data for the San José International Airport, Moffett and Shoreline colonies or other colonies formed in the permit area. This will be accomplished by protecting land on the valley floor and in the Diablo Range in fee title purchase or by obtaining easements as part of the Reserve System, or through management agreements. Target areas will include modeled overwintering only, occupied nesting, and potential nesting habitat (LAND-G6, G7, and G8). As a result, nesting habitat will be protected or managed within four distinct geographical regions: North San José /Baylands, Gilroy, Morgan Hill, and South San José (**Figure 5-11**).

All sites protected within the Reserve System and on lands where management agreements exist will be enhanced to encourage the expansion of burrowing owls (GRASS-5, 6, 8, and 9). Acquisition, enhancement, and restoration conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), valley oak woodlands (see Section 5.3.5 *Oak and Conifer*



*Woodland Conservation and Management*), and seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*) are intended to benefit western burrowing owl through breeding and foraging habitat conservation and management.

## Habitat Acquisition and Enhancement

As indicated above, the Implementing Entity will manage a minimum of 5,300 acres for the western burrowing owl nesting habitat (occupied and potential) by Year 45. Of this acreage, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement in accordance to the rough proportionality provision for the burrowing owl, described in Section 8.6.1. For the remaining 4,700 acres, land acquisition (fee title or easement) or management agreements may be used. The Implementing Entity will prioritize land acquisition over management agreements. All 5,300 acres of western burrowing owl nesting habitat will be acquired or under a permanent management agreement by Year 45.

The 5,300 acres will include burrowing owl nesting habitat within 5 miles of the San José water Pollution Control Plant bufferlands, north of Highway 237 (LAND-G6) and burrowing owl nesting habitat within 5 miles of the San José International Airport or other important northern San José breeding sites (LAND-G7). Because the North San José/Baylands region is the most important for burrowing owl conservation and has the most conservation opportunities, a goal is set for 70% (3,700 acres) of the total land management commitment occurring in that region and the expanded permit area. Further, a recommended 15% (800 acres) of the total land managed would occur in the Gilroy region. The remaining 15% should remain flexible and could occur in any of the regions, but it is assumed that 5% (270 acres) occur in the South San José region and 10% (530 acres) occur in the Morgan Hill region.

Management agreements may be used in place of land acquisition on up to 4,700 acres, if the specified regional targets cannot be met through land acquisition. During the permit term, temporary management agreements may be put into place rather than permanent management agreements. Temporary management agreements (e.g., 10–20 year agreements as opposed to agreements in perpetuity) may be used to protect nesting habitat on areas not immediately planned for development as long as the amount of land permanently protected in fee title or conservation easement is consistent with the Stay-Ahead provision (Chapter 8, Section 8.6.1 *Stay-Ahead Provision*, subheading *Rough Proportionality and Stay-Ahead for the Burrowing Owl Conservation Strategy*). By Year 45 of the permit term, all management agreements must be permanent.

The management agreements must be legally binding documents to which the Wildlife Agencies are parties. Their establishment will follow a process similar to land acquisition described in Chapter 8, Section 8.6 *Land Acquisition*. The management agreements will be consistent with the land acquisition process; however, the Implementing Entity would work with the land owner to establish the management agreement rather than acquiring the land in fee title or with a

conservation easement. The duration and management requirements will be agreed upon by all parties and specified in the management agreement document. For the permanent management agreements, management must be assured in perpetuity. For temporary management agreements, management must be assured for the duration of the agreement. As parties to the management agreements, the Wildlife Agencies will have review and approval authority.

Although the Implementing will protect and/or manage a minimum of 5,300 acres no later than Year 45 of the permit term, the preliminary goals described above regarding the distribution of these lands in the amongst the burrowing owl conservation zones may shift during the permit term upon close coordination with the Wildlife Agencies. However, the total amount of lands managed for the burrowing owl will be maintained or increase until the goals of the Plan are achieved. In other words, parcels where management for burrowing owls is discontinued need to be replaced prior to discontinuation of management with parcels of equal or better habitat value and size. The Implementing Entity will track management agreements to ensure the amount of managed lands for the burrowing owl at no time decrease during the permit term.

To ensure the burrowing owl conservation strategy's progress, the Implementing Entity will confer with the Wildlife Agencies no later than Year 15 to assess how well the strategy is meeting its intended purpose. This coordination will be in addition to the annual reporting described in Chapter 8. If it becomes evident that portions of the burrowing owl strategy will not be feasible, a Plan amendment, as described in Chapter 10, may be necessary.

In addition to managing 5,300 acres of occupied and potential nesting habitat, the Implementing Entity will also protect, through fee title or easement, modeled overwintering habitat. There are 132,770 acres of western burrowing owl overwintering modeled habitat within the permit area. A total of 28,517 acres (21%) of that modeled habitat are located in Type 1, 2, or 3 open space with 12,584 acres (9%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 17,000 acres of modeled overwintering habitat for the Reserve System. In addition, 4,310 acres of modeled habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected overwintering habitat in the permit area to 26% in Type 1 open space and about 34% in Type 1, 2, or 3 open space (**Table 5-17**).

Modeled overwintering habitat for western burrowing owl will be permanently preserved, managed, and enhanced throughout the Reserve System in all major watersheds in the permit area. Overwintering habitat will be protected in low elevation grassland valleys in the Diablo Range that currently support California ground squirrels, have supported California ground squirrels since 1997, or are adjacent to lands with existing California ground squirrel colonies (LAND-G8). Low elevation valleys within the Reserve System that are located on the valley floor or in the Diablo Range will be managed to benefit nesting and overwintering burrowing owls. Some locations on the southern edges of the City of San José could support burrowing owls in the future. In addition, several acres will be acquired in the southern part of the permit area in the Pescadero

watershed that could be converted to annual grassland and managed for western burrowing owls. Nearly all land acquisition in areas dominated by annual grassland has the potential to benefit overwintering owls. Most of that land acquisition will occur along Coyote Ridge, west of Chesbro Reservoir, west and east of Calero Reservoir, and between Henry W. Coe State Park and the San Benito County line. This land acquisition has been primarily targeted for other covered species but will have incidental conservation benefit for western burrowing owls, especially during the winter months.

Land that is acquired through fee title purchase or easement to meet biological goals and objectives for burrowing owl occupied nesting and overwintering habitat in the permit area will be selected using the reserve design principles described in Chapter 5. Lands acquired and/or managed for burrowing owl nesting habitat will also meet the following criteria.

## Location Criteria

When identifying and acquiring the 600 acres for permanent protection and enrollment into the Reserve System, the Implementing Entity will use the following guidelines.

1. The Implementing Entity will preferentially select a parcel that is inside of the Habitat Plan study area over a parcel that is inside of the expanded study area for burrowing owl conservation.
2. The Implementing Entity will preferentially select parcels that are closer (i.e., within 0.5 mile) to documented nest locations over those that are farther away.
3. Parcels that do not meet criteria 2 (above) may be considered on a case-by-case basis to allow the Implementing Entity to take advantage of opportunities that better fit the conservation strategy<sup>32</sup>.

## Habitat Criteria

The 600 acres of occupied nesting habitat acquired for the Reserve System must have the following:

1. Documented nesting burrowing owls on the parcel in at least one of the previous 3 years. Parcels that are currently occupied should be selected first, followed by parcels that have been occupied in the previous 3 three years.
2. Be surrounded by at least 140 acres of foraging habitat within 0.5 mile of a nest site (including the parcel where nesting was documented). If there is no potential for foraging habitat to be protected through future acquisition, conservation easement, or management agreement, the nest site should not be

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<sup>32</sup> It is not the intent of the burrowing owl conservation strategy to permanently protect or permanently manage lands in urban areas that are anticipated to be developed (e.g., the North First Street area of San José).

acquired unless long-term viability of the site can be in some other way demonstrated.

3. Currently supports ground squirrels or is located adjacent to another parcel with ground squirrels.
4. Currently support grassland, barren, or other land cover types that can be managed or modified to enhance the site to increase the habitat quality for burrowing owls.

## Management Techniques and Tools

The general principles for grassland management will be followed in all grassland or barren areas (Section 5.3.3, *Grassland Conservation and Management*). Management techniques may include any or all of those outlined in Section 5.3.3 *Grassland Conservation and Management*, and those that will be most beneficial to burrowing owls are grazing and mowing. See **Appendix M** for more details on management techniques and tools for western burrowing owl.

## Uncertainties and Threats

Urbanization has been a threat to western burrowing owls in the South Bay Area for many years and as suitable habitat is developed that threat remains. All of the remaining nesting locations are very near urban development and are located on vacant lands that either have a high potential to be developed in the future, or are managed for purposes other than burrowing owl (e.g., airports). As such, nesting habitat will be subject to many threats typically associated with urban areas, feral cats, pets, commensally wildlife (e.g., skunks, raccoons), and disturbance from humans. Because many of the conservation actions will occur in proximity to urban areas, these threats will continue.

Because population numbers are so low and the number of nesting locations is less than 10, the PVA in this Plan (**Appendix N**) has demonstrated that there is considerable danger of the local population going extinct. While the conservation strategy is designed to reverse this trend, there is uncertainty in its likelihood of success. The success of the strategy is contingent on the remaining colonies being viable over the long term through protection and improved management. This strategy must also be implemented over a shorter time period than for other covered species in order to be successful. This time constraint creates additional uncertainty.

## 5.4.7 Least Bell's Vireo

### Biological Goals and Objectives

The Implementing Entity will work to facilitate the expansion of breeding least Bell's vireos into the study area and increase reproductive success of the bird. This will be done by acquiring and restoring riparian woodland and forest with an open canopy and understory of willows. Acquisition, enhancement, and restoration conservation actions identified for riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*) will benefit least Bell's vireo through breeding and foraging habitat conservation and management.

### Habitat Acquisition, Restoration, and Enhancement

There are 3,097 acres of primary least Bell's vireo modeled habitat in the study area. A total of 330 acres (11%) of modeled habitat are located on Type 1, 2, or 3 open space with 65 acres (2%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 460 acres of least Bell's vireo primary modeled habitat (as described in **Appendix D**) for the Reserve System (**Table 5-17**). In addition, 2 acres of primary modeled habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area to about 17% in Type 1 open space and 26% in Type 1, 2, or 3 open space (**Table 5-17**).

Least bell's vireo primary modeled habitat is defined as willow and mixed riparian forest and scrub, including California sycamore alluvial woodland, in the Uvas, Llagas, Pacheco, and Pajaro watersheds in south Santa Clara County (see **Appendix D**). Riparian land cover types preserved in these watersheds will meet the commitment to acquire 460 acres of least Bell's vireo modeled habitat (**Table 5-17**). Least Bell's vireo acquisition will focus on specific areas within each designated watershed based on historic occurrence information and known range.

In the Pacheco watershed protection will be focused along Pacheco Creek, including the confluence of Little Pacheco Creek and Pacheco Creek. Acquisitions and easements along Uvas Creek will be focused above Uvas Reservoir and intermittently along the creek as it flows southeast to the Pajaro River. Acquisition along lower Uvas-Carnadero Creek will benefit the least Bell's vireo. The only nesting occurrence of least Bell's vireo in Santa Clara County in the last 40-years was along lower Llagas Creek.

The Implementing Entity will focus first on protection of riparian corridors that either have existing nesting habitat for the least Bell's vireo or have the potential to be restored to a riparian condition in the short term. Specific areas of acquisition commitments are listed below.

- 1.6-mile extension of the Uvas Creek Park Preserve upstream to the Hecker Pass Highway (LAND-R1).
- 2.0 miles along the main stem of Pacheco Creek that are in Santa Clara County between Pacheco Lake and San Felipe Lake (LAND-R1).

Additional protection and restoration of riparian corridors in south County watersheds are expected to benefit least Bell's vireo. Similarly, protection and restoration of riparian woodland on Coyote Creek may also benefit least Bell's vireo if that species expands its range to the north into the Coyote Creek watershed. Riparian restoration planned on Coyote Creek under the proposed Three Creeks HCP is likely to count towards Habitat Plan requirements and has potential to benefit this species.

In addition to habitat acquisition into the Reserve System, the Implementing Entity will also restore or create a minimum of 50 acres of willow riparian forest and scrub or mixed riparian forest and woodland to contribute to natural community recovery (**Table 5-12**). If all allowable impacts occur, the Implementing Entity would restore these land cover types at a ratio of 1:1 (an additional 289 acres), for a maximum of 339 acres of restoration or creation. Most of this restoration would occur in south Santa Clara County due to the greater restoration opportunities there. Therefore, most of the 50–289 acres of riparian restoration would create additional foraging and nesting habitat for least Bell's vireo.

## Management Techniques and Tools

Several riparian restoration and enhancement techniques will increase the amount and quality of nesting and foraging habitat for least Bell's vireo. In general, returning riverine systems to a more natural condition (i.e., flow and function) will maintain an array of successional stages for riparian vegetation in associated riparian corridors. This in turn will increase the total acreage of nesting habitat available for least Bell's vireo at any given time. In many cases these restoration efforts will constitute replacing concrete channels, to restore geomorphic and ecological functions to stream reaches that currently do not provide those functions (STREAM-4). Channels that are not necessarily concrete but that are similarly confined will also be replaced, to restore floodplain benches and commensurate functions within stream reaches that currently do not provide those functions (STREAM-5). Specific stream and riparian conservation and management goals, objectives, and actions are discussed above (Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), but they are reiterated below.

In order to provide structural heterogeneity the Implementing Entity will plant and/or seed in native understory and overstory riparian vegetation in riparian restoration sites (STREAM-2). In most cases planting or seeding will occur in existing gaps in native riparian vegetation to promote continuity of riparian corridors (STREAM-3). This will ensure that there are various successional stages along these corridors, rather than a corridor that is dominated by mature

trees. In a natural setting vegetation succession is controlled by natural events like scouring floods and fires. Absent those events, succession is not interrupted and mature trees dominate the community while early successional vegetation is lost. Without early successional vegetation in a riparian community, species like the least Bell's vireo will not occur. In order to retain some level of all successional stages of vegetation within a riparian community, activities that mimic natural physical processes, such as girdling trees, will be implemented to encourage early successional vegetation to grow (STREAM-5).

A brown-headed cowbird management program will be implemented if least Bell's vireos become regular nesters in the study area (>3 nests over at least two consecutive years) and brown-headed cowbird eggs are discovered in vireo nests (STREAM-7). The monitoring and management program will be implemented consistent with guidelines of the North American Cowbird Advisory Council, or the best scientific information available at the time, and with oversight from CDFG and USFWS. If other predators are shown to adversely affect the nest success of vireo's (e.g., feral cats, raccoons, skunks), additional predator control may be necessary (LM-13). If monitoring shows that cowbirds are not reducing the nest success of vireos then the cowbird management program will be terminated.

## Uncertainties and Threats

An ongoing threat to songbird breeding success is the brown-headed cowbird. This brood parasite reduces the total number of young produced per breeding songbird pair and lowers the overall success rate for the population. Attempts to control brown-headed cowbirds through trapping or shooting have shown short-term benefits to riparian songbird species, including the Bell's vireo. Implementation of a brown-headed cowbird control program was discussed above.

### 5.4.8 Tricolored Blackbird

#### Biological Goals and Objectives

The Implementing Entity will work to increase the population size of tricolored blackbird in the study area. This will be accomplished by protecting at least four sites that support, historically supported, or could support tricolored blackbird colonies. Each protected site will have at least 2 acres of breeding (marsh) habitat and will have at least 200 acres of foraging habitat within 2 miles. These breeding sites will either be enhanced or restored breeding habitat in historically/currently occupied areas within the Reserve System or newly created ponds suitable for breeding tricolored blackbirds. Acquisition, enhancement, and restoration/creation conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), valley oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and*

*Scrub Conservation and Management*), and wetlands and ponds (see Section 5.3.7 *Wetland and Pond Conservation and Management*) will benefit tricolored blackbird through breeding, foraging, and year-round habitat conservation and management.

## Acquisition, Restoration, and Creation

There are 140,291 acres of tricolored blackbird modeled habitat within the study area. A total of 29,435 acres (21%) of that habitat are located in Type 1, 2, or 3 open space with 11,037 acres (8%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 19,000 acres of modeled primary and secondary habitat for the Reserve System. In addition, 3,840 acres of modeled primary and secondary habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of modeled habitat in the study area to about 24% in Type 1 open space and 35% Type 1, 2, or 3 open space (**Table 5-17**).

As part of the preservation acreages above, the Implementing Entity will acquire 5 acres of modeled breeding habitat within dry land farming or ranching complexes in Coyote Valley and the Diablo Hills (LAND-WP8). A high priority will be given to currently occupied sites or sites that have been occupied since 1997. Additional preference will be given to historic breeding sites that could be restored. Land acquisition to benefit tricolored blackbird will occur in the areas between Henry W. Coe State Park and San Felipe Lake in San Benito County. Historically San Benito Lake has supported nesting tricolored blackbirds so protection of modeled breeding and foraging habitat near there will benefit the species over the long term. Additional protection in the Pescadero and Tar Creek watersheds southwest of Gilroy will simultaneously protect modeled nesting habitat and adjacent foraging habitat near two historic occurrences. There are also areas that will be protected along the Pacheco Creek corridor where there is modeled breeding habitat surrounded by agricultural lands or annual grasslands, which provide the necessary breeding and foraging habitat combination. Additional modeled habitat will be preserved, enhanced, and monitored west and south of Chesbro Reservoir.

In order to ensure adequate breeding and foraging habitat is available for future breeding colonies the Implementing Entity will offer financial incentives to private landowners to enhance pond and marsh habitat to suit breeding tricolored blackbirds and to modify farming or ranching techniques to ensure that dry-land farming and ranching activities are executed in a way that is compatible with nesting and foraging tricolored blackbirds (POND-14, POND-15). The Implementing Entity will help landowners apply for existing grants (e.g., North American Wetlands Conservation Act Small Grants Program [USFWS], or Environmental Quality Incentives Program of the Farm Bill [USDA Natural Resources Conservation Service]) as well as provide supplemental funds in the event that grants are unsuccessful. In addition, the Implementing Entity will ensure that there is at least 200 acres of permanently protected modeled foraging habitat within 2-miles of tricolored blackbird breeding sites protected under the Plan (LAND-WP9). If there is not adequate modeled foraging habitat available



in existing Type 1 open space within 2 miles of breeding sites protected under the Plan, the difference in acreage, up to 200 acres per breeding site, will be protected through acquisition or easement within 2 miles of each breeding site.

In addition to protecting new breeding habitat the Implementing Entity will also restore freshwater marsh that will support dense reed-like vegetation (cattails) or other native vegetation (nettles) that will attract nesting tricolored blackbirds (POND-16). Each of these areas will include at least 2 acres of breeding habitat surrounded by sufficient foraging habitat. Of the 20 acres of newly created ponds within the permit area (POND-10), and the estimated 52 acres of ponds to mitigate for the loss of ponds to covered activities, those surrounded by suitable tricolored blackbird foraging habitat will be managed to support dense-reed like vegetation adequate for tricolored blackbird nesting.

In areas with nonnative vegetation (e.g., Himalayan blackberry) that supports existing tricolored blackbird colonies, the Implementing Entity will initiate a gradual (3–4-year) transition from nonnative vegetation to native vegetation that is structurally similar (POND-17). This would only be implemented if the USFWS and CDFG determined that the colony was large enough and stable enough to accommodate the change. In most cases the vegetation would not be altered unless the colony was abandoned for at least three breeding seasons. In riparian areas, constrained channels will be replaced with more natural channels to restore geomorphic and ecological functions to stream reaches that currently do not provide those functions (STREAM-4). This will ensure that a variety of successional stages are supported within riparian corridors, including side channels and benches where slower water supports marsh-like vegetation.

## Management Techniques and Tools

The management techniques that will be utilized to promote tricolored blackbird nesting colony success are captured above (Section 5.3.7 *Wetland and Pond Conservation and Management*). Those management techniques include:

- Planting of native emergent vegetation.
- Fencing off portions of ponds or wetlands to reduce grazing pressure and exclude feral pig activity.
- Implementation or continuation of a grazing program in potential foraging habitat within 2-miles of known breeding colonies.

## Uncertainties and Threats

Tricolored blackbird colonies are an ephemeral resource. Nest colonies can persist for many years in the same location or sites can be occupied irregularly over time. In order to control for this uncertainty when attempting to protect or reestablish nesting colonies it is important to concentrate protection and management efforts in areas that either support or have some documentation of

historical breeding colonies. It is highly likely that breeding habitat can be protected, restored, or created and breeding blackbirds will never occupy it.

## 5.4.9 San Joaquin Kit Fox

### Biological Goals and Objectives

The Implementing Entity will work to increase the ability of San Joaquin kit fox to move within and through the study area and increase the likelihood of breeding. Because the study area is outside the three San Joaquin kit fox core areas,<sup>33</sup> land acquisition and habitat enhancement focuses on building connections between the more isolated satellite populations in order to contribute to the *Level A Strategy* to “work toward the establishment of a viable complex of kit fox populations (i.e., a viable metapopulation) on private and public lands throughout its geographic range”, as identified in *Recovery Plan for Upland Species of the San Joaquin Valley* (U.S. Fish and Wildlife Service 1998a). In addition, the Plan supports the *Habitat Protection and Population Interchange Recovery Action xiv* to “Protect existing kit fox habitat in the northern, northeastern, and northwestern segments of their geographic range...” (U.S. Fish and Wildlife Service 1998a).

This will be accomplished by protecting land through fee title purchase or easement and managing those lands as part of the Reserve System. Protection will be focused in areas with land cover types such as annual grasslands and oak woodlands, where this species has the highest potential to occur (see **Appendix D**). In accordance with the *Level A Strategy*, these protected areas will have a diversity of soils types, topography, aspect, and other environmental gradients to account for movement, foraging, and resting habitat (U.S. Fish and Wildlife Service 1998a). The Reserve System will benefit San Joaquin kit fox in the Pacheco Creek watershed in the uplands between Pacheco State Park and the Romero Ranch in the southeastern corner of the study area. Additional Reserve lands will be acquired between Henry W. Coe State Park and San Felipe Lake that will also benefit the species. The Reserve System will help to ensure that if San Joaquin kit fox are able to cross SR 152 that they will be able to fully utilize the lowland hills of the Diablo Range. In line with in the *Population Ecology and Management Recovery Action*, the Implementing Entity will enhance grassland and oak woodland habitat within the Reserve System to support a more abundant prey base (i.e., California ground squirrels) for San Joaquin kit fox (U.S. Fish and Wildlife Service 1998a).

Outside of the Reserve System the Plan will also contribute to the *Level A Strategy* goal on private land (U.S. Fish and Wildlife Service 1998a). The Implementing Entity will work to influence land-uses that are compatible with kit fox movement. Most importantly the Implementing Entity will identify

<sup>33</sup> As identified by the *Recovery Plan for Upland Species of the San Joaquin Valley*, there are three identified core populations of San Joaquin kit fox: Carrizo Plain Natural Area, Natural lands of western Kern County, and Fresno and eastern San Benito Counties (U.S. Fish and Wildlife Service 1998a).

important habitat linkages across SR 152, between the SR 152/156 interchange and the Santa Clara/Merced County line. Working with road operators (VTA and Caltrans), the Implementing Entity will improve passage along this highway when future road improvements are designed and implemented. Improvements will include removal or “perforation” of sections of median barriers along roadways to improve successful wildlife crossings and, if biologically appropriate, installation of fencing or other features to direct wildlife to those open sections (LM-5).

Acquisition, enhancement, and restoration of grasslands (see Section 5.3.3 *Grassland Conservation and Management*), oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), riparian forest and scrub (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*), and seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*) in the southern portion of the County are expected benefit to San Joaquin kit fox through foraging and movement habitat conservation and management.

## Acquisition and Enhancement

There are 40,892 acres of modeled San Joaquin kit fox habitat (includes secondary and low-use secondary habitat) within the study area. Although not modeled, some of this habitat may also be potential breeding habitat. A total of 6,315 acres (15%) of modeled habitat are located in Type 1, 2, or 3 open space with 5,067 acres (12%) permanently protected as Type 1 open space. The Plan proposes to add a minimum of 4,100 acres of modeled habitat to the Reserve System, increasing the proportion of protected modeled habitat in the study area to about 22% as Type 1 open space and 25% as Type 1, 2, or 3 open space (**Table 5-17**).

As stated above, land acquisition and habitat enhancement will contribute to species recovery by building connections among the satellite populations in the northern part of the species’ range (U.S. Fish and Wildlife Service 1998a). The Implementing Entity will protect through fee title acquisition or easements annual grassland and associated oak woodland land cover types (e.g., oak savanna and oak woodland within 500 feet of annual grassland) north and south of SR 152, east of the SR 152/156 interchange (LAND-G9).

This portion of the study area has the highest potential to support San Joaquin kit fox, though SR 152 is a considerable barrier across the landscape. Land acquisition along Pacheco Creek would benefit kit fox by preserving likely movement routes, foraging habitat, and possible (although unlikely) den sites (i.e., breeding sites). Specific areas where enhancement could occur to increase the permeability of SR 152 include the undercrossing where Little Pacheco Creek flows into Pacheco Creek and several other small drainages that flow under the roadway before connecting with Pacheco Creek on the south side of the road (**Figure 5-7b**). This will ensure that if costly enhancements are made to roadway infrastructure to create better connections for this species, that the natural lands on either side of the roadway will also remain high quality habitat in perpetuity.

Several grassland restoration and enhancement techniques will increase the amount and quality of movement habitat for San Joaquin kit fox. In general, managing nonnative vegetation and overtime increasing the amount of native vegetation in the ecosystem will have a positive effect on grassland ecosystem function. In turn this will benefit predators like the San Joaquin kit fox by supporting a more sustainable prey population. The Implementing Entity will introduce livestock grazing where it is not currently used, and where conflicts with covered activities will be minimized, to reduce vegetative cover and biomass that currently excludes ground squirrels facilitate colonization of new areas by ground squirrels within the Reserve System (GRASS-6). Specific grassland conservation and management goals, objectives, and actions are discussed above (Section 5.3.3 *Grassland Conservation and Management*).

## Management Techniques and Tools

Several specific actions will be taken by the Implementing Entity to improve passage for San Joaquin kit fox. At locations indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, the Implementing Entity in coordination with the road operator will remove fences, replace culvert, and install free span bridges to allow wildlife to move freely under and over roadways (LM-1, LM-2, LM-3). To increase the probability that wildlife will use these crossings fencing or other features will be installed that will direct wildlife attempting to cross the roadway towards the culvert or other safe crossing (LM-4). Further, road operators will be required to remove or perforate median barriers, where allowable and safe, to improve successful wildlife crossings and, as indicated by targeted studies and informed by the monitoring and adaptive management program, install fencing or other features to direct wildlife to those open sections (LM-5).

To ensure that California ground squirrels and other rodents are as abundant as possible within the Reserve System the Implementing Entity will cease the use of rodenticides within the Reserve System except when necessary to maintain structures (e.g., levees, roads, stock pond dams) or to prevent nuisance populations (as defined in the Fish and Game Code Sections 4150 and 4152) from moving onto adjacent private lands (GRASS-5). Further, the Implementing Entity in coordination with road operators will remove fences and roads where they are no longer needed and to increase landscape permeability for wildlife movement (LM-1). Road removal may include road removal and decommission (i.e., returned to a natural condition) or road stabilization and abandonment to reduce hazards to wildlife and to reduce the erosion potential associated with dirt and gravel roads. This will allow many native species, including San Joaquin kit fox, to move more freely within the Reserve System.

In addition to protecting and restoring modeled habitat and improving structures the Implementing Entity will conduct a public education campaign in the southeastern portion of the study area to provide landowners with information about management and land use techniques that are more compatible with movement and use by San Joaquin kit fox (GRASS-10).

## Uncertainties and Threats

The level to which San Joaquin kit fox uses the study area for movement, foraging, or denning is uncertain. San Joaquin kit fox have been documented moving through the lowlands just east of the study area and it is likely that individuals occasionally move into Santa Clara County. Also it will be difficult to monitor and measure the effectiveness of crossings structures. Other wildlife species (e.g., coyote, bobcat) will likely be used as surrogate species to determine whether these crossing structure adequately facilitating movement, since San Joaquin kit fox occur at such low numbers.

### 5.4.10 Tiburon Indian Paintbrush

There are a total nine known occurrences of Tiburon Indian paintbrush throughout its range. There are two occurrences in the study area. Population estimates for this species exist for all except one of the occurrences (see Chapter 4, Section 4.6.8 *Serpentine Plants* for population estimates). In the study area, one occurrence is located on a mitigation site, under a temporary easement, for creation of the Kirby Canyon Landfill. The second occurrence, located in the North Canyon, is privately owned. At the time this Plan was being developed, the landfill operator was in the process of finalizing a conservation easement as compensation for the recent expansion of the landfill. Impacts from management activities to the one occurrence currently under temporary easement, consistent with the conservation strategy of the Plan, are the only impacts allowed to the species in the permit area. These impacts will be temporary in nature and will result in overall benefits to the occurrence. This Plan does not cover impacts to additional occurrences of Tiburon Indian paintbrush that may be discovered during the permit term (**Tables 4-6 and 5-16**).

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and enhance Tiburon Indian paintbrush by acquiring the occurrence currently under a temporary easement at the Kirby Canyon Landfill, and by increasing the size of the occurrence within the permit area to at least 2,000 individuals (**Table 5-16**).

Tiburon Indian paintbrush is expected to benefit from acquisition and enhancement of grassland natural communities that serve as primary habitat and/or provide suitable habitat for occurrence expansion (see Section 5.3.3 *Grassland Conservation and Management*).

## Occurrence Acquisition

The two known occurrences of Tiburon Indian paintbrush in the study area will be permanently protected upon successful implementation of the Plan. The

North Canyon occurrence is anticipated to be permanently protected with a conservation easement by the landfill operator prior to the finalization of this Plan and permit issuance. The Implementing Entity will acquire the other occurrence of Tiburon Indian paintbrush, which is under a temporary easement to mitigate effects of Kirby Canyon Landfill. Although the current easement expires in 2034, the Implementing Entity may permanently protect this occurrence at any time before Year 45 of the permit term.

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses. Adverse land uses include permanent land uses that could endanger the long-term viability of the occurrence; including urban development, landfill, and other intensive land uses. This buffer may be reduced or increased in specific circumstances where, based on documented site conditions, plant occurrences are protected from adverse land uses by another means or site conditions warrant a larger buffer. For example, if a major physical barrier separates the occurrence from the land use or the occurrence is located upslope from the adverse land use, the buffer may be reduced. Conversely, if there are certain adverse land uses upslope from the occurrence and effects to the occurrence are expected, a buffer greater than 500 feet may be needed. A 500-foot buffer was recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c).

## Management Techniques and Tools

The one occurrence protected under this Plan will be increased to or maintained at least 2,000 individuals in order to ensure the yearly viability of the occurrences (U.S. Fish and Wildlife Service 1998c). In order to successfully manage the Reserve System's occurrence of Tiburon Indian paintbrush, targeted studies will be conducted to identify factors limiting the expansion of the occurrence (STUDIES-5). These studies may focus on various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5). Additional studies to determine the effects of livestock grazing on Tiburon Indian paintbrush will exclude livestock and monitor the effects on occurrences; control sites will be incorporated into these studies (STUDIES-16), unless the Implementing Entity demonstrates that the required action is biologically inappropriate. Results of all research studies will be incorporated into reserve unit management plans to mitigate or remove the limiting factors.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for the Tiburon Indian paintbrush will be established. To assist the long-term viability of this species, a permanent conservation seed bank for Tiburon Indian paintbrush will be established in the National Collection of Endangered Plants operated by the Center for Plant Conservation as a national repository of endangered plant seed stock. Seeds will be deposited at a local custodial institution (e.g., a botanic garden) designated by the Center for Plant Conservation. A permanent conservation seed bank provides long-term storage in an accredited facility of a

representative sample of seeds from wild occurrences. All known occurrences in the Reserve System will be represented in the conservation seed bank unless collection would pose a threat to the occurrence's continued existence. Occurrences will be maintained in the seed bank separately to ensure the genetic diversity of the bank. The seed bank will be replenished as necessary to maintain the genetic integrity of the stock. The conservation seed bank will serve as a repository of the species to guard against extinction of the species from chance catastrophic events and to provide potential material for enhancement efforts in existing occurrences, repatriations, or introductions to new sites (STUDIES-14).

## Uncertainties and Threats

There is still much to learn regarding the management of Tiburon Indian paintbrush. Because management and conservation decisions for this species are limited in their potential efficacy, the Implementing Entity has little information with which to design and plan specific management and monitoring protocols. Accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5).

Potential threats to these occurrences appear to be minimal (S. Weiss pers. comm. b). One threat may be cattle grazing; however, it is not clear whether grazing benefits or adversely affects Tiburon Indian paintbrush. Recent evidence suggests the Paintbrush Hill occurrence of Tiburon paintbrush is being predated upon by black-tailed jackrabbit. This predation may be the cause of occurrence decline at this location. Exclosure experiments are currently being conducted to determine the validity of this hypothesis (C. Niederer pers. comm.). For these reasons, the Tiburon paintbrush occurrence will be monitored to assess the impacts of grazing or predation (STUDIES-16). Adaptive management decisions can then be developed on the basis of monitoring results.

### 5.4.11 Coyote Ceanothus

There are a total of three known occurrences of Coyote ceanothus throughout its range. One additional reported occurrence, from Croy Canyon in 1929, is believed to be erroneous and will not be discussed further in this section (see **Appendix D Species Accounts** for more information). All known occurrences are located in the study area. One of these occurrences is located northwest and southeast of Anderson Dam, east of U.S. 101. The two other occurrences are located on private property near Kirby Canyon Landfill and in Morgan Hill. All three of the known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts by covered activities are limited to 3,650 individuals or 5%, whichever is less, of the Anderson Dam occurrence (**Tables 4-6 and 5-16**). This standard will be applied to the population as it existed during the 2009 surveys. It will not be applied to any new recruits that are a result of natural or artificial disturbance event such as fire.

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of Coyote ceanothus by protecting a total of five occurrences in the permit area (**Table 5-16**). Included in the five occurrences protected will be the three known extant occurrences. Protection of the remaining two occurrences will be accomplished through two possible methods, in order of priority: (1) acquire land for the Reserve System that supports a new occurrence by Year 45, or (2) create new occurrences by Year 40.

Within 5 years of the impact at Anderson Dam, one occurrence will be protected or created. The timing of the seismic retrofit of Anderson Dam is currently uncertain, but is expected to occur within the first 5 years of the permit term. Project implementation may need to occur sooner than anticipated due to public safety concerns. If the impacts of the project on Coyote ceanothus are greater than what was evaluated in the Plan, additional mitigation may be required to offset the additional impacts. This may also require a Plan amendment as described in Chapter 10, Section 10.3 *Modifications to the Plan*.

The total number of Coyote ceanothus occurrences protected by this Plan deviates from the number suggested in the species' Recovery Plan. The Recovery Plan (U.S. Fish and Wildlife Service 1998c) recommends the protection of eight populations prior to the consideration of delisting. There have only been three populations of this species ever discovered<sup>34</sup>, even prior to extensive development of the Santa Clara Valley. In addition, the characteristics of existing populations suggest that finding five new occurrences is highly unlikely. The Plan assessed the potential for creation of new occurrences by examining soil types, proximity to known populations, and other features of habitat suitability. It was determined that creation of two occurrences is feasible but not more. Therefore, the Habitat Plan is justified in deviating from the recommendations of the Recovery Plan.

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

In addition, Coyote ceanothus may benefit from acquisition and enhancement of natural communities that serve as primary habitat and may contain known or undiscovered occurrences, and/or provide suitable habitat for occurrence creation, including serpentine grasslands (see Section 5.3.3 *Grassland Conservation and Management*) and serpentine chaparral (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*).

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<sup>34</sup> The Recovery Plan considers the Anderson Dam population as two separate occurrences, consistent with data in the CNDDDB (resulting in 5 total occurrences). For the purposes of this Plan, the Anderson Dam population is considered a single occurrence that was split by the construction of the dam (resulting in a total of 3 occurrences). A genetic study underway will help to understand the population structure of this species.



## Occurrence Acquisition

Regardless of the level of impact, the three known occurrences in the study area will be incorporated into the Reserve System (LAND-P1). Protection of occurrences will be accomplished by acquiring land for the Reserve System that supports the three unprotected occurrences. In addition, the Implementing Entity will protect two new occurrences. If new occurrences cannot be found or acquired in the Reserve System, then the Implementing Entity will create occurrences to reach this target, as described below. Acquisition may occur through fee title purchase or by obtaining conservation easements. Acquisition of the three known occurrences must occur by Year 45 (the deadline for all Reserve System acquisition).

## Occurrence Creation

If acquisition of two new occurrences is infeasible, the Implementing Entity will create up to two new occurrences of Coyote ceanothus (i.e., if no new occurrences are acquired, two will be created and if one new occurrence is acquired, one will be created). The Implementing Entity will develop a plan with the Wildlife Agencies for each occurrence creation. Each plan will include a process for creating the occurrence (e.g., use of propagules vs. use of cuttings), monitoring the created occurrence, and determining viability.

If the creation is not needed to fulfill requirements associated with covered activity implementation, the creation may occur later in the permit term but no later than by Year 40. Creation may be delayed until later in the permit term because of the need to: (1) exhaust opportunities to discover new occurrences (which are the first priority), (2) assemble enough of the Reserve System to provide suitable habitat for occurrence creation, and (3) allow sufficient time to study optimum habitat conditions, target occurrence size and structure, and propagation techniques. The decision to focus conservation efforts on occurrence creation will be made jointly with the Wildlife Agencies. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size and structure for created occurrences based on empirical data collected on occurrences in the Reserve System and other best available science.

Population creation for Coyote ceanothus should occur on suitable sites within the Reserve System if possible. However, if no suitable sites are available in the Reserve System when they are needed to meet the deadlines (either within 5 years of the Anderson Dam impact or prior to Year 40), population creation could occur on suitable sites outside of the Reserve System if the site meets the definition of Type 1 open space and the site is managed and monitored according to the Plan.

Suitable habitat for created occurrences will be identified based on the habitat of known occurrences and any other available data at the time of acquisition (STUDIES-5). Because two of the three known extant occurrences of Coyote

ceanothus are on the east side of the Coyote Valley, the focus will be to increase the range of the species by creating the new occurrences on the west side of the valley unless the Implementing Entity demonstrates to the Wildlife Agencies that such occurrence creation is biologically infeasible. This effort will involve identifying a suitable creation site and determining biologically appropriate and viable propagation or planting techniques for this species (STUDIES-13, STUDIES-14). It will also entail studies to determine the biologically appropriate seed sampling techniques and harvest numbers for acquisition of seed from existing occurrences (STUDIES-14). In addition, field experiments will be conducted (if the number of propagules allows) to test alternative techniques for occurrence establishment using seeds (STUDIES-15) or through other mechanisms such as use of cuttings.

Coyote ceanothus is a large, woody shrub that often grows in dense, monotypic stands. Because of the possibility that a new creation could displace serpentine grasslands, created occurrences will be sited to minimize the potential for displacement of habitat for other covered species.

## **Anderson Dam Seismic Retrofit**

One occurrence will be created within 5 years of the Anderson Dam impact if a known or new occurrence has not been protected. The Anderson Dam impact is anticipated to occur in 2016. Because of the challenges of protecting one occurrence early in the permit term, the SCVWD has started efforts that will support creation of a Coyote ceanothus occurrence including the following.

- Communicating with Pepperdine University which is conducting a genetic (microsatellite) study to determine population structure.
- Communicating with UC Davis on its study of genetics (S-allele) to assess breeding system/reproductive success/population viability; and Frankia soils study to examine potential microsymbiont relationship and importance of native soil to population creation.
- Identified and mapped potentially suitable introduction sites on land recently purchased by the SCVWD on Coyote Ridge.
- Seed collection and storage from the Anderson Dam population occurrences.

Based on the studies, SCVWD will prepare a draft occurrence creation plan. Some key components include the following.

- Documentation of successful propagation methods from seed and/or cuttings in test plots by December 2013.
- Verification of site suitability and potential introduction sites through soil analysis of sites with known populations by July 2017.
- Full-scale planting effort (will involve additional seed collection and propagation) with survival monitoring; implemented between July 2017 and February 2018.

The work being conducted by SCVWD may help support the studies requirements of the Plan for this species.

## Management Techniques and Tools

To successfully manage existing occurrences and create new occurrences of Coyote ceanothus, targeted studies will be conducted to determine factors limiting the expansion of extant occurrences, as well as those necessary for establishment and maintenance of a created occurrence (STUDIES-5). Such studies will include the effect of fire on seed germination and other possible germination requirements. If necessary, studies may also be conducted to determine requirements for successful transplanting to augment new occurrences. Other studies may focus on various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5).

The targeted studies will be used to inform the target occurrence size for managed occurrences. A preliminary goal of 5,000 individuals per occurrence will be implemented as recommended in *Ceanothus ferrisiae* (Coyote ceanothus) *5-Year Review: Summary and Evaluation* (U.S. Fish and Wildlife Service 2011); if approved by the Wildlife Agencies, this number will be adjusted as necessary pending research carried out during Plan implementation to assure viable occurrences of this species.

Prescribed burns (CHAP-1) or an appropriate fire-management policy (LM-8) in chaparral, as well as managed grazing or mechanic thinning of chaparral (CHAP-2), may result in improved habitat or occurrence longevity for Coyote ceanothus. Although fire appears to be beneficial to recruitment and regeneration, burning will not be implemented on a large scale in areas with Coyote ceanothus occurrences until additional monitoring or other data collection has occurred to determine if these occurrences would be likely to benefit by being burned. The management actions above are targeted to maintain structural diversity and canopy gaps and to promote regeneration of chaparral species, which may directly or indirectly benefit Coyote ceanothus.

At least one prescribed burn (CHAP-1) will be implemented at a site yet to be identified. This area will be burned to facilitate the species' re-growth within 5 years of implementation of the Anderson Dam seismic retrofit covered activity. Subsequent burns may be conducted during the permit term, as appropriate, through the adaptive management process described in Chapter 7. Prescribed burns will promote regeneration and improve stand health. A qualified biologist will oversee the prescribed burn.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for Coyote ceanothus will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12). Coyote ceanothus is the only covered plant species where created occurrences could be counted toward the mitigation component of

the Plan. In all other cases, created plant occurrences will only count toward the conservation component of the Plan. If creation is used to meet the impact mitigation component of the conservation strategy for this species, seed banking will be completed prior to the impacts.

## Uncertainties and Threats

Very little precise information about the ecology of this species exists, including information on the relationship between life history stages, population dynamics, and fire. Recent information and observations have indicated that the absence of fire may be detrimental to recovery and long-term persistence of this species (U.S. Fish and Wildlife Service 2011). It is unknown, however, if Coyote ceanothus seeds require fire for germination and establishment; accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5).

It is not clear if general management actions (i.e., burning or clearing chaparral) will in fact benefit or adversely affect Coyote ceanothus. For this reason, any such actions in or adjacent to Coyote ceanothus occurrences will include a monitoring component to assess impacts. Adaptive management decisions can then be developed on the basis of monitoring results (STUDIES-11).

### 5.4.12 Mt. Hamilton Thistle

There are a total of 48 known occurrences of Mt. Hamilton thistle throughout its range. There are 40 known occurrences in the study area. Only 34 of the 48 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts to six known occurrences are allowed by covered activities if no additional occurrences are discovered during the permit term (Tables 4-6 and 5-16).

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of Mt. Hamilton thistle by acquiring and enhancing at least 22 known, extant occurrences (Table 5-16) if no additional occurrences are discovered during the permit term. Two of the 22 occurrences are located in Santa Teresa County Park and Anderson Lake County Park and will be incorporated into the Reserve System.

The Implementing Entity will manage and monitor the 22 occurrences so that each maintains a minimum occurrence size of 2,000 individuals as recommended by the Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (U.S. Fish and Wildlife Service 1998c). The Recovery Plan's conservation strategy for Mt. Hamilton thistle recommends preserving a total of

23 populations, 55% of which should be in the “San José area” (13 populations) and 35% of which should be in “northeastern Santa Clara County and northwestern Stanislaus Counties” (eight populations). The Habitat Plan will protect and manage 22 occurrences of Mt. Hamilton thistle in perpetuity, exceeding the Recovery Plan conservation recommendations for populations in and around Santa Clara County. As such, implementation of the Plan will not cause jeopardy to, or preclude recovery of, Mt. Hamilton thistle.

Mt. Hamilton thistle is expected to benefit from acquisition and enhancement of the grassland natural communities, as these land cover types include the serpentine seeps and streams that serve as primary habitat and contain known or undiscovered occurrences (see Section 5.3.3 *Grassland Conservation and Management*).

## Acquisition of Modeled Habitat

There are 487 acres of primary modeled habitat for Mt. Hamilton thistle within the study area. A total of 204 acres (42%) of modeled habitat are located in Type 1, 2, or 3 open space with 55 acres (11%) permanently protected as Type 1 open space. The Plan will acquire a minimum of 150 acres of modeled habitat for the Reserve System. In addition, 60 acres of primary modeled habitat will be added to the Reserve system from existing open space. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area to about 54% in Type 1 open space and 73% in Type 1, 2, or 3 open space (Table 5-17).

Mt. Hamilton thistle is one of eight Covered Species addressed in the Recovery Plan for Serpentine Soil Species of the Bay Area (U.S. Fish and Wildlife Service 1998c). At the time the Recovery Plan was written, known occurrences of Mt. Hamilton thistle were distributed nearly evenly on the east and west side of U.S. 101. Since the writing the Recovery Plan, and during the writing of this Plan, many more occurrences have been identified. Most new occurrences are located on the serpentine areas in and around Coyote Ridge on the east side of U.S. 101. The occurrences on the east side of the valley follow a network of drainages unique to Coyote Ridge. These drainages do not occur on the west side of the valley. As such, the Plan will focus conservation efforts for Mt. Hamilton thistle on acquiring occurrences along Coyote Ridge on the east side of the valley (J. Hillman pers. comm. and Hillman 2007). Acquisition will also be located in similar drainages that flow into San Felipe Creek. In addition, acquisition, as well as enhancement, will occur in the Santa Cruz Mountains between Calero County Park and Almaden Quicksilver County Park and on Tulare Hill.

## Occurrence Acquisition

Regardless of the level of impact, 22 known occurrences in the permit area will be acquired and incorporated into the Reserve System (LAND-P6). An effort

will be made to acquire sites in the study area on both sides of Coyote Valley to ensure geographic diversity in protected occurrences in accordance with recommendations made in the Serpentine Recovery Plan (U.S. Fish and Wildlife Service 1998c). Target acquisitions include known occurrences along Coyote Ridge (an estimated 9 of 22 occurrences). Two other occurrences in Santa Teresa and Anderson Lake County parks will be acquired, enhanced, and monitored.

There are size estimates for 36 of the known occurrences of this species, from as early as 1983 up to as recently as 2008. These estimates range from 1 to 4,500 individuals, and the total estimated size of all occurrences is 28,962 (California Natural Diversity Database 2009). Only 12 of the 22 occurrences to be protected in the Reserve System have size estimates, and these total 7,810 individuals. The total number to be protected is likely to be much larger than this estimate. In addition, since this is a short-lived, two-year perennial species that depends on local hydrology, these numbers are likely to fluctuate from year to year in response to annual fluctuations in rainfall and runoff into serpentine seeps.

As described in Chapter 4, the impact limit for this species could increase from 6 occurrences if no additional occurrences are discovered during the permit term to 8 occurrences if additional occurrences are discovered during the permit term. A minimum of 3 occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 21 occurrences will be acquired and protected in the Reserve System before a 7<sup>th</sup> occurrence is impacted and a minimum of 24 occurrences will be acquired and protected in the Reserve System before an 8<sup>th</sup> occurrence is impacted. “Minimums” are referenced here because the Implementing Entity will protect 22 occurrences, regardless of impacts. The timing of acquisition of 18 of the 22 occurrences are linked to impacts, while the remaining 4 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 4 occurrences are not linked to impacts. The newly discovered and acquired occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Management Techniques and Tools

To successfully manage existing occurrences of Mt. Hamilton thistle, targeted studies will be conducted to determine factors limiting the expansion of extant occurrences (STUDIES-5). Such studies will include examining the effects of livestock grazing on the species by experimentally excluding livestock and

monitoring the effects on occurrences; control sites will be incorporated into these studies (STUDIES-16). Other studies may focus on various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5).

The targeted studies will be used to inform the target occurrence size for managed occurrences. The definition of an occurrence for this species depends on the location: an occurrence on the east side of Coyote Valley is defined as all occurrences in a discrete drainage, while an occurrence on the west side of Coyote Valley is defined as a specific occurrence point because the western occurrences are more likely to occur at isolated points rather than in a network of drainages (J. Hillman pers. comm.). Specific target occurrence size will be developed by Year 10 of implementation, based on empirical data collected on occurrences in the Reserve System and other best available science. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size.

Because Mt. Hamilton thistle only occurs along creeks and drainages, the hydrologic systems that maintain these features are critical to the survival and occurrence growth of this species. Therefore, the Implementing Entity will manage and maintain the hydrologic systems (e.g., springs, streams, ponds) that support Mt. Hamilton thistle.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for Mt. Hamilton thistle will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Very little precise information about the ecology and population biology of this species is available, including information on the species' reproductive biology and demography. Its highly restricted habitat requirements in serpentine seeps, springs and drainages are likely limiting factors in the species' distribution and abundance. The hydrologic systems that maintain this habitat will be managed and maintained by the Plan. It is also possible that invasive weeds and insects have adverse effects and pose significant threats to the species. Further research into these threats is necessary to successfully manage this species (STUDIES-5).

It is not clear whether grazing benefits or adversely affects Mt. Hamilton thistle. For this reason, grazing in or adjacent to Mt. Hamilton thistle occurrences will include experimental exclusions and control sites, where feasible, to evaluate impacts (STUDIES-16). Adaptive management decisions can then be developed on the basis of monitoring results.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for Mt. Hamilton thistle will

be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

### 5.4.13 Santa Clara Valley Dudleya

There are a total of 209 known occurrences of Santa Clara Valley dudleya, 207 of which are in the study area. Only 47 of the 209 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts are allowed to 11 known occurrences by covered activities (**Tables 4-6 and 5-16**) if additional occurrences are not discovered during the permit term.

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of Santa Clara Valley dudleya by acquiring and enhancing a minimum of 55 occurrences in the permit area (**Table 5-16**), if no additional occurrences are discovered during the permit term. Eleven of the 55 occurrences are located in County parks and will be protected when these parks are added to the Reserve System.

Santa Clara Valley dudleya is expected to benefit from the acquisition and enhancement of those grasslands (see Section 5.3.3 *Grassland Conservation and Management*) and oak woodlands that include serpentine rock outcrops (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*).

## Occurrence Acquisition

Regardless of the level of impact, the Implementing Entity will acquire (through acquisition or conservation easement) lands that support 55 extant occurrences of Santa Clara Valley dudleya throughout its entire range in the permit area (LAND-P2). In accordance with the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c), occurrences will be distributed throughout the range of the species (north, central, and south). The Implementing Entity will stratify protection and acquire sites in the study area on both sides of Coyote Valley to ensure geographic diversity in protected occurrences. The majority of the known occurrences will be acquired, enhanced through improved management, and monitored along Coyote Ridge in Coyote-4, 5, and 6. The number of occurrences in parentheses after each location name will also be acquired: Santa Teresa Hills and Tulare Hill (4), west of Calero County Park (2), and north of Morgan Hill (1). Incorporation of portions of Santa Teresa, Calero, Anderson Lake and Almaden Quicksilver County parks into the Reserve System (**Table 5-5**) will protect 11 of the 55 occurrences and provide opportunities for improved management and



monitoring. This will bring total protection of this species to 57 occurrences in Type 1 open space.

The Recovery Plan recommends the protection of one occurrence in the San Martin Area because this represented the southern extent of the species range known at the time. There are two extant occurrences of Santa Clara dudleya near San Martin. One is located on a highly-parcelized, privately-owned plot and is not practical for acquisition consideration. The other occurrence is, at the writing of this Plan, in the process of being protected by a conservation easement for mitigation associated with the Corde Valle Golf Course<sup>35</sup>. Since the finalization of the Recovery Plan, the species' known range expanded south of the San Martin area (i.e., to Mount Madonna County Park). In response to new information collected since the finalization of the Recovery Plan, the Implementing Entity will acquire at least one occurrence (either known or found during the permit term) of Santa Clara Valley dudleya in the southern end of its range in the study area. This could include either the southwest or southeast portion of the study area. Therefore, the Implementing Entity will not focus on acquiring occurrences in the San Martin area.

As described in Chapter 4, the impact limit for this species could increase from 11 occurrences, if no additional occurrences are discovered during the permit term, to 14 occurrences, if additional occurrences are discovered during the permit term. A minimum of 4 occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 48 occurrences will be acquired and protected in the Reserve System before a 12<sup>th</sup> occurrence is impacted, a minimum of 52 occurrences will be acquired and protected in the Reserve System before a 13<sup>th</sup> occurrence is impacted, and a minimum of 56 occurrences will be acquired and protected in the Reserve System before a 14<sup>th</sup> occurrence is impacted. "Minimums" are referenced here because the Implementing Entity will protect 55 occurrences, regardless of impacts. The timing of acquisition of 44 of the 55 occurrences are linked to impacts, while the remaining 11 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 11 occurrences are not linked to impacts. The newly discovered and acquired occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

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<sup>35</sup> This will be considered a protected occurrence once a conservation easement holder is identified and the conservation easement recorded.

## Management Techniques and Tools

To successfully manage existing occurrences of Santa Clara Valley dudleya, targeted studies will be conducted to determine the biological definition of a population and the relationship between known occurrences and genetically-defined populations. Studies will also be conducted to determine factors limiting the expansion of extant occurrences (STUDIES-5). Such studies may include examining the effects of livestock grazing on the species by experimentally excluding livestock and monitoring the effects on occurrences (STUDIES-16). Other studies may focus on various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5).

The targeted studies will be used to inform the target occurrence size for managed occurrences. For this species, the relationship between population and recorded occurrence is unclear. It is possible that multiple occurrences compromise a single population. A preliminary goal of 2,000 individuals per population will be implemented as recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c); if approved by the wildlife agencies, this number will be adjusted as necessary pending research carried out during Plan implementation to assure viable occurrences of this species.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for Santa Clara Valley dudleya will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Santa Clara Valley dudleya is a relatively well-studied plant, and more information and research is available for this species than for most of the other covered species. However, outstanding questions remain regarding the definition of a population and management issues. Research will be conducted to better define a population for this species to understand the effects of grazing. Management research will be conducted on grazing effects on Santa Clara Valley dudleya as discussed above (STUDIES-16) and on other limiting factors (STUDIES-5).

### 5.4.14 Fragrant Fritillary

There are a total of 59 known occurrences of fragrant fritillary throughout its range. There are eight known occurrences in the study area. Thirty-five of the 59 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more details). One of these known occurrences is expected

to be impacted by covered activities, if no additional occurrences are discovered during the permit term (**Tables 4-6 and 5-16**).

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the size of populations of fragrant fritillary by acquiring and enhancing a total of four occurrences in the permit area, if no additional occurrences are discovered during the permit term (**Table 5-16**). Of these four occurrences, two will be located in the Diablo Range and two in the Santa Cruz Mountains to protect occurrences of this species across its range and across different environmental gradients.

Fragrant fritillary is expected to benefit from acquisition and enhancement of natural communities that serve as its primary or secondary modeled habitat, may contain known or undiscovered occurrences, and/or provide suitable habitat for occurrence creation, including grasslands (see Section 5.3.3 *Grassland Conservation and Management*), chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*), oak and conifer woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), and seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*).

## Acquisition of Modeled Habitat

There are 165,455 acres of fragrant fritillary modeled habitat (primary and secondary) within the study area. A total of 42,317 acres (26%) of modeled habitat are located on Type 1, 2, or 3 open space with 16,371 acres (10%) permanently protected as Type 1 open space. The Plan will acquire a minimum of 23,000 acres of modeled habitat for the Reserve System. In addition, 4,000 acres will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area about 26% in Type 1 open space and 39% in Type 1, 2, or 3 open space (**Table 5-17**). Land acquisition that would protect primary and secondary modeled habitat would occur in almost all Conservation Analysis Zones in the study area in which land acquisition would occur.

## Occurrence Acquisition

Regardless of the level of impact, four known extant occurrences of fragrant fritillary will be acquired for the Reserve System. Of these four, two occurrences will be protected along Coyote Ridge southeast of Metcalf Canyon and northeast of Morgan Hill (LAND-P8). The third occurrence is located in Calero County Park and will be protected through the incorporation of a portion of the park into the Reserve System (**Table 5-5**). The fourth occurrence will be located in the Santa Cruz Range.

As described in Chapter 4, the impact limit for this species could increase from 1 occurrence, if no additional occurrences are discovered during the permit term, to 3 occurrences, if additional occurrences are discovered during the permit term. A minimum of 3 occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 6 occurrences will be acquired and protected in the Reserve System before a 2<sup>nd</sup> occurrence is impacted and a minimum of 9 occurrences will be acquired and protected in the Reserve System before a 3<sup>rd</sup> occurrence is impacted. “Minimums” are referenced here because the Implementing Entity will protect 4 occurrences, regardless of impacts. The timing of acquisition of 3 of the 4 occurrences are linked to impacts, while the remaining 1 occurrence will be acquired for recovery purposes only and thus acquisition timing of this 1 occurrence is not linked to impacts. The newly discovered and protected occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Management Techniques and Tools

To successfully manage newly acquired occurrences of fragrant fritillary, targeted studies will be conducted to determine factors that limit occurrence expansion as well as those necessary for establishment and maintenance of new occurrences (STUDIES-5). Such studies may include specific seed germination requirements and successful transplantation requirements to create or augment new occurrences. Other studies may examine various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5). Adaptive management decisions can then be developed on the basis of monitoring results.

The targeted studies will be used to inform the target occurrence size for each managed occurrence. The specific target occurrence size will be developed by Year 10 of implementation, based on empirical data collected on occurrences in the Reserve System and other best available science. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size.

To help the long-term viability of this species, a permanent conservation seed bank for fragrant fritillary will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Very little precise information about the ecology of this species exists, including details of its life history stages, population dynamics, microhabitat requirements (e.g., edaphic factors), demography, and pollination biology. Directed studies to determine limiting factors on survival and reproduction will help to successfully maintain and increase the size of occurrences of fragrant fritillary in perpetuity (STUDIES-5).

The actual occurrence size and age structure of the extant occurrences of fragrant fritillary in the study area are currently unknown. A key management action will be to survey extant occurrences as they are added to the Reserve System and to monitor these occurrences regularly to quantify and track the occurrence structure over time (STUDIES-5). This information will also be used to determine the targeted viable occurrence size of managed occurrences.

It is not clear whether grazing benefits or adversely affects fragrant fritillary. For this reason, grazing in or adjacent to fragrant fritillary occurrences will include experimental exclusions and control sites, where feasible, to evaluate impacts (STUDIES-16). Adaptive management decisions can then be developed on the basis of monitoring results.

### 5.4.15 Loma Prieta Hoita

There are a total of 26 known occurrences of Loma Prieta hoita throughout its range. There are 14 known occurrences in the study area. Only 18 of the 26 occurrences have population estimates (see Chapter 4, Section 4.6.9 *Non-Serpentine Plants* for more details). No impacts are allowed to these occurrences by covered activities (**Tables 4-6 and 5-16**).

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of Loma Prieta hoita by acquiring and enhancing four extant occurrences within the study area (**Table 5-16**), if no additional occurrences are found during the permit term. Of the four occurrences, three are currently located in County parks. Loma Prieta hoita is expected to benefit from acquisition and enhancement of natural communities that serve as primary or secondary modeled habitat and/or contain known or undiscovered occurrences, including chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*), oak and conifer woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), and mixed riparian forest and woodland (see Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management*).

## Acquisition of Modeled Habitat

There are 121,871 acres of Loma Prieta hoita modeled habitat (primary and secondary) within the study area. A total of 38,667 acres (32%) of modeled habitat are located on Type 1, 2, or 3 open space with 17,276 acres (14%) permanently protected as Type 1 open space. The Plan will acquire a minimum of 10,000 acres of modeled habitat for the Reserve System. In addition, 4,100 acres of modeled habitat will be added to the Reserve System from existing open space. These additions and acquisitions will increase the proportion of protected modeled habitat in the study area to about 26% in Type 1 open space and 40% in Type 1, 2, or 3 open space (**Table 5-17**).

## Occurrence Acquisition

Regardless of impact, 4 occurrences will be acquired or added to the Reserve System. Of these, three occurrences will be permanently protected by inclusion of portions of Santa Teresa, Almaden Quicksilver and Calero County parks (**Table 5-5** and **Figure 5-4**), and a fourth occurrence will be acquired on the east side of the Santa Clara Valley, just east of U.S. 101, south of Motorcycle Park. It does not have a size estimate (California Natural Diversity Database 2009).

As described in Chapter 4, the impact limit for this species could increase from 0 occurrences if no additional occurrences are discovered during the permit term to 2 occurrences if additional occurrences are discovered during the permit term. A minimum of two occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 2 occurrences will be acquired and protected in the Reserve System before the 1<sup>st</sup> occurrence is impacted and a minimum of 4 occurrences will be acquired and protected in the Reserve System before the 2<sup>nd</sup> occurrence is impacted. “Minimums” are referenced here because the Implementing Entity will protect four occurrences, regardless of impacts. The timing of these recovery efforts are not linked to impacts. The newly discovered and protected occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Management Techniques and Tools

To successfully manage existing occurrences of Loma Prieta hoita, targeted studies will be conducted to determine factors limiting the expansion of extant

occurrences (STUDIES-5). Other studies may focus on factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5). Adaptive management decisions can then be developed on the basis of monitoring results.

The targeted studies will be used to inform the target occurrence size for managed occurrences. The specific target occurrence size will be developed by Year 10 of implementation, based on empirical data collected on occurrences in the Reserve System and other best available science. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size.

A permanent conservation seed bank for Loma Prieta hoita will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Loma Prieta hoita has not been well studied, and little is known about its population biology or ecological effects and needs. Because management and conservation decisions for this species are limited in their potential efficacy, the Implementing Entity has little information with which to design and plan specific management and monitoring protocols. Accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5).

The actual occurrence size and age structure of the extant occurrences of Loma Prieta hoita in the study area are currently unknown. A key management action will be to survey and monitor the new occurrence when it is added to the Reserve System and at regular intervals thereafter to quantify and track the occurrence structure over time (STUDIES-5). This information will also be used to determine the targeted viable occurrence size of managed occurrences.

Threats to Loma Prieta hoita are thought to include cattle grazing and trampling, feral pig rooting, development, and vegetation clearing. Studies may be conducted to investigate the details of these threats and the best measures to mitigate them (STUDIES-5).

### 5.4.16 Smooth Lessingia

There are a total of 39 known occurrences of smooth lessingia throughout its range. All known occurrences are located in the study area. Only 22 of the 39 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts are allowed to six known occurrences by covered activities, if no additional occurrences are discovered during the permit term (Tables 4-6 and 5-16).

## Biological Goals and Objectives

Regardless of impact, the Implementing Entity will protect, maintain the viability of, and increase the number and size of occurrences of smooth lessingia by protecting and enhancing a total of 24 occurrences in the permit area (**Table 5-16**) if no additional occurrences are discovered during the permit term. Twelve of the 24 protected occurrences must be naturally-occurring populations and will fulfill mitigation requirements for the impact of up to six occurrences. Five of these twelve natural occurrences will be protected through the incorporation of County Park lands into the Reserve System. To contribute to recovery, an additional 12 occurrences will be protected by the Implementing Entity through two possible methods, in the order of priority: (1) acquire land for the Reserve System that supports new or rediscovered historical occurrences by Year 45, or (2) create new occurrences within the Reserve System by Year 40.

Smooth lessingia is expected to benefit from acquisition and enhancement of grassland natural communities that serve as primary habitat, may contain known occurrences, and/or provide suitable for occurrence expansion (see Section 5.3.3 *Grassland Conservation and Management*).

## Acquisition of Modeled Habitat

There are 10,491 acres of primary smooth lessingia modeled habitat within the study area. A total of 3,659 acres (35%) of modeled habitat are located on Type 1, 2, or 3 open space with 1,268 acres (12%) permanently protected as Type 1 open space. The Plan will acquire a minimum of 4,000 acres of modeled habitat, including seven new occurrences, for the Reserve System. In addition, 1,100 acres of modeled habitat will be added to the Reserve System from existing open space, including five known occurrences. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area to about 61% as Type 1 open space and 73% as Type 1, 2 or 3 open space (**Table 5-17**).

## Occurrence Acquisition

Regardless of impacts, five known occurrences will be acquired through the incorporation of portions of Santa Teresa, and Calero County parks into the Reserve System (**Table 5-5** and **Figure 5-4**) to improve management, habitat enhancement, and long-term monitoring. The Implementing Entity will also acquire seven additional natural occurrences of smooth lessingia (LAND-P7) regardless of impacts.

Only two of the protected occurrences have size estimates, which total 1,815. The seven additional new occurrences that would be acquired by Plan implementation are located on the west side of U.S. 101 in the Santa Cruz Mountains foothills, on serpentine areas between Tulare Hill and Mount Madonna County Park. The Implementing Entity will also protect an additional



twelve new occurrences in the Reserve System to contribute to species recovery (LAND-P7; **Table 5-16**). If these twelve occurrences cannot be found or acquired in the Reserve System, then the Implementing Entity will create occurrences (i.e., if no occurrences are acquired, twelve occurrences will be created, if one occurrence is acquired, eleven occurrences will be created, etc.) as described below.

As described in Chapter 4, the impact limit for this species could increase from 6 occurrences, if no additional occurrences are discovered during the permit term, to 9 occurrences, if additional occurrences are discovered during the permit term (**Table 5-16**). A minimum of two occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 14 occurrences will be protected in the Reserve System before a seventh occurrence is impacted, a minimum of 16 occurrences will be protected in the Reserve System before a eighth occurrence is impacted, and a minimum of 18 occurrences will be protected in the Reserve System before a ninth occurrence is impacted. “Minimums” are referenced here because the Implementing Entity will protect 24 occurrences, regardless of impacts. The timing of acquisition of 12 of the 24 occurrences are linked to impacts (as described in Chapter 4), while the remaining 12 occurrences will be acquired to contribute to recovery and can be acquired at any time before Year 45. The newly discovered and protected occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Occurrence Creation

If 12 new occurrences of smooth lessingia are not acquired for the purposes of recovery, the Implementing Entity will create up to 12 occurrences of smooth lessingia (i.e., if no occurrences are acquired, 12 will be created; if one occurrence is acquired, 11 will be created, etc.). Creation is only considered as a conservation action, not mitigation.

Occurrence creation is expected to occur later in the permit term (but no later than by Year 40) because of the need to: (1) exhaust opportunities to discover new occurrences (which are the first priority), (2) assemble enough of the Reserve System to provide suitable habitat for occurrence creation, and (3) allow sufficient time to study optimum habitat conditions, target occurrence size and structure, and propagation techniques. The decision to focus conservation effort on occurrence creation will be made jointly with CDFG and USFWS. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size and structure for created occurrences based on

empirical data collected on occurrences in the Reserve System and other best available science.

Suitable habitat for created occurrences will be identified based on the habitat of known occurrences and any other available data at the time of acquisition (STUDIES-5). Suitable propagation and/or planting techniques will be researched and identified to create new occurrences of smooth lessingia from existing occurrences within Santa Clara County or adjacent watersheds (STUDIES-14). Biologically appropriate seed sampling techniques from existing occurrences, including sustainable harvest amounts, will also be determined through field and literature research (STUDIES-14). Additionally, if the number of propagules allow, field experiments will be conducted to test alternative techniques for occurrence establishment (STUDIES-15).

## Management Techniques and Tools

Targeted studies will be used to inform the target occurrence size for managed occurrences. A preliminary goal of 2,000 individuals per occurrence will be implemented as recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c); if approved by the wildlife agencies, this number will be adjusted as necessary pending research carried out during Plan implementation to assure viable occurrences of this species.

Targeted studies will be conducted to determine factors limiting the expansion of extant occurrences (STUDIES-5). Such studies will include examining the effects of livestock grazing on the species by experimentally excluding livestock and monitoring the effects on occurrences (STUDIES-16). Other studies may focus on various factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5).

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for smooth lessingia will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Very little information about the ecology and general habitat requirements of this species exists, including details of its life history stages, population dynamics, microhabitat requirements, demography, and pollination biology. Accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5). The management needs of the species also need investigation.

The actual size of the extant occurrences of smooth lessingia are mostly unknown. A key management action will be to survey extant occurrences as they are added to the Reserve System and monitor these occurrences regularly to quantify and track the occurrence structure over time (STUDIES-5).

Threats to smooth lessingia are thought to include cattle grazing, foot traffic (trampling), competition from invasive nonnative plants, and road and trail maintenance. Studies may be conducted to investigate the details of these threats and the best measures to mitigate them (STUDIES-5). It is not clear whether grazing benefits or adversely affects smooth lessingia. For this reason, grazing in or adjacent to smooth lessingia occurrences will include experimental exclusions and control sites, where feasible, to evaluate impacts (STUDIES-16). Adaptive management decisions can then be developed on the basis of monitoring results.

### 5.4.17 Metcalf Canyon Jewelflower

There are 11 known occurrences of Metcalf Canyon jewelflower throughout its range, 10 of which are in the study area. Only four of the 10 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts are allowed to two of the known occurrences by covered activities (Tables 4-6 and 5-16).

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of Metcalf Canyon jewelflower by protecting a total of 13 occurrences in the permit area. To do this, the Implementing Entity will acquire and enhance at least three known occurrences in the permit area (Table 5-16). The Implementing Entity will also protect 10 new occurrences through two possible methods, in order of priority: (1) acquire land for the Reserve System that supports new or rediscovered historical occurrences by Year 45, or (2) create new occurrences within the Reserve System by Year 40.

Metcalf Canyon Jewelflower is expected to benefit from acquisition and enhancement of grassland natural communities that serve as its primary habitat, contain known occurrences, and/or provide suitable habitat for occurrence creation (see Section 5.3.3 *Grassland Conservation and Management*).

## Acquisition of Modeled Habitat

There are 8,105 acres of primary modeled habitat for Metcalf Canyon jewelflower within the study area. A total of 2,843 acres (35%) of modeled habitat are located on Type 1, 2, or 3 open space with 984 acres (12%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 3,200 acres of modeled habitat for the Reserve System. In addition,

1,000 acres of modeled habitat will be added to the Reserve System from existing open space. These acquisitions and additions will increase the proportion of protected modeled habitat in the study area to about 64% as Type 1 open space and 75% as Type 1, 2, or 3 open space (**Table 5-17**).

Land acquired for the Reserve System will protect suitable habitat for Metcalf Canyon jewelflower on the north side of Tulare Hill on the west side of Coyote Valley (LAND-P4). Suitable habitat in this area includes serpentine grasslands and serpentine outcrops and road cuts that have little soil development and are surrounded by grasslands. Target areas include Coyote Ridge near Metcalf Canyon where 68 occurrences of an unidentified jewelflower have been found (Arcadis 2008). It is unclear how many of these are Metcalf Canyon jewelflower but due to the proximity of known occurrences, many are likely to be this subspecies (the other likely candidate is most beautiful jewelflower).

## Occurrence Acquisition

Regardless of the level of impact, the Implementing Entity will acquire at least three known extant occurrences of Metcalf Canyon jewelflower (LAND-P3). Acquisition of the three known occurrence must occur prior to the first impact. The Implementing Entity will also identify and protect an additional 10 new occurrences in the Reserve System to contribute to species recovery by Year 45 (the deadline for all Reserve System acquisition). If 10 new occurrences cannot be found and acquired in the Reserve System, then the Implementing Entity will create occurrences (i.e., if no occurrences are acquired, 10 will be created; if one occurrence is acquired, nine will be created, etc.) as described in the section below.

*The Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c) calls for the acquisition of nine natural occurrences of Metcalf Canyon jewelflower to meet recovery criteria. At the time the Recovery Plan was written there were 13 known, extant occurrences of Metcalf Canyon jewelflower in the study area. Currently, there are 10 known, extant occurrences within the study area. Several of these occurrences are located on private lands that are highly parcelized and urbanized, making them low-priority targets for conservation.

The Habitat Plan will protect the highest quality natural occurrences. In combination with the one existing occurrence protected in Type 1 open space, there will be four protected natural occurrences in the study area prior to the first impact to the species or by Year 45 of the Plan, whichever comes first. There are several “jewelflower” occurrences that have yet to be determined to be Metcalf Canyon jewelflower or most beautiful jewelflower. Some of these occurrences are likely to be Metcalf Canyon jewelflower. Acquisition of these or other natural occurrences would be prioritized to meet the requirement to acquire or create ten more occurrences to contribute to species recovery.

In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as

described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Occurrence Creation

If new occurrences of Metcalf Canyon jewelflower are not found and preserved, the Implementing Entity will create up to 10 occurrences of Metcalf Canyon jewelflower (i.e., if no occurrences are acquired, 10 will be created; if one existing occurrence is acquired, nine will be created, etc.). Creation is only considered as a conservation action, not mitigation.

Occurrence creation is expected to occur later in the permit term (but no later than by Year 40) because of the need to: (1) exhaust opportunities to discover new occurrences (which are the first priority), (2) assemble enough of the Reserve System to provide suitable habitat for occurrence creation, and (3) allow sufficient time to study optimum habitat conditions, target occurrence size and structure, and propagation techniques. The decision to focus conservation effort on occurrence creation will be made jointly with CDFG and USFWS. The Implementing Entity, in coordination with the Wildlife Agencies, will determine the target occurrence size and structure for created occurrences based on empirical data collected on occurrences in the Reserve System and other best available science.

Targeted studies and current research will be used to inform new occurrence establishment. Suitable habitat for created occurrences will be identified based on the habitat of known occurrences and any other available data at the time of acquisition (STUDIES-5). This will involve identifying suitable locations in the Reserve System and researching and identifying biologically appropriate and viable propagation or planting techniques for this species (STUDIES-13, STUDIES-14). It will also entail conducting field and literature research to determine the biologically appropriate seed sampling techniques and harvest numbers for acquisition of seed from existing occurrences (STUDIES-14). In addition, field experiments will be conducted (if the number of propagules allows) to test alternative techniques for occurrence establishment (STUDIES-15). Extensive research is being done on the propagation needs and responses of this species by Justen Whittall and co-investigators at Santa Clara University (Whittall 2008, 2011); preliminary results indicate that successful occurrence creation is feasible. In addition, their field surveys suggest that sites for 10 occurrences should be available (J. Whittall pers. comm.; Whittall 2011). Their results and expertise, along with other scientific data available during Plan implementation, will be consulted during Plan implementation.

The Recovery Plan (U.S. Fish and Wildlife Service 1998c) recommends that protected populations be distributed throughout the range of the species, including at least 25% west of U.S. 101 and 75% in the Metcalf Canyon area, east of U.S. 101. The Implementing Entity will consider these guidelines as associated with protection and creation efforts for this Plan unless best available science indicates that a different distribution would be more beneficial to the

conservation of the species. There are currently no known occurrences west of U.S. 101.

## Management Techniques and Tools

To successfully manage and create new occurrences of Metcalf Canyon jewelflower, targeted studies will be conducted to determine factors that limit occurrence expansion, as well as those necessary for establishment and maintenance of new occurrences (STUDIES-5). Such studies may include specific seed germination requirements and successful transplantation requirements to create or augment new occurrences. Other studies may examine factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5).

The targeted studies will be used to inform the target occurrence size for managed occurrences. A preliminary goal of 2,000 individuals per occurrence will be implemented as recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c); if approved by the Wildlife Agencies, this number will be adjusted as necessary pending research carried out during Plan implementation to assure viable occurrences of this species.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for Metcalf Canyon jewelflower will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Metcalf Canyon jewelflower has not been well studied, and little is known about its population biology or ecological effects and needs. Because management and conservation decisions for this species are limited in their potential efficacy, the Implementing Entity has little information with which to design and plan specific management and monitoring protocols. Accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5).

The actual size and age structure of the extant occurrences of Metcalf Canyon jewelflower in the study area are currently unknown. A key management action will be to survey extant occurrences as they are added to the Reserve System and regularly monitor these occurrences, as well as the newly created occurrence, to quantify and track occurrence structure over time (STUDIES-5).

Threats to Metcalf Canyon jewelflower are thought to include cattle grazing, urban development, off-road motorcycles, garbage dumping, and road

construction and maintenance. Studies may be conducted to investigate the details of these threats and the best measures to mitigate them (STUDIES-5).

### 5.4.18 Most Beautiful Jewelflower

There are a total of 86 most beautiful jewelflower known occurrences throughout its range. There are 39 known occurrences within the study area. Only 40 of the 86 known occurrences have population estimates (see Chapter 4, Section 4.6.8 *Serpentine Plants* for more information). Impacts to six known occurrences are allowed by covered activities (**Tables 4-6 and 5-16**) if no additional occurrences are discovered during the permit term.

## Biological Goals and Objectives

The Implementing Entity will protect, maintain the viability of, and increase the number and size of populations of most beautiful jewelflower by acquiring and enhancing 17 known extant occurrences in the permit area, if no additional occurrences are discovered during the permit term (**Table 5-16**). This includes acquisition of nine known occurrences for the Reserve System and the addition of eight known occurrences when portions of Alamaden Quicksilver, Calero, and Santa Teresa County parks are added into the Reserve System.

Most beautiful jewelflower is expected to benefit from acquisition and enhancement of natural communities that serve as its primary or secondary habitat and/or contain known extant occurrences, including grasslands (see Section 5.3.3 *Grassland Conservation and Management*) and chaparral and coastal scrub (see Section 5.3.4 *Chaparral and Northern Coastal Scrub Conservation and Management*).

## Acquisition of Modeled Habitat

There are 14,362 acres of most beautiful jewelflower modeled habitat (primary and secondary) within the study area. A total of 5,042 acres (35%) of modeled habitat are located on Type 1, 2, or 3 open space with 1,500 acres (10%) permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 4,000 acres of modeled habitat for the Reserve System. In addition, 1,700 acres of modeled habitat will be added to the Reserve System from existing open space. These acquisitions and addition will increase the proportion of protected modeled habitat in the study area to about 50% as Type 1 open space and 63% as Type 1, 2, or 3 open space (**Table 5-17**).

Land acquired for the Reserve System will protect suitable habitat along Coyote Ridge, in the Santa Teresa Hills, and west of Chesbro Reservoir, as well as, near Morgan Hill and in the southern end of the study area in the Santa Cruz Mountain foothills. Target areas include Coyote Ridge near Metcalf Canyon

where 68 occurrences of an unidentified jewelflower have been found (Arcadis 2008). It is unclear how many of these are most beautiful jewelflower but due to the proximity of known occurrences, many are likely to be this subspecies (the other likely candidate is Metcalf Canyon jewelflower).

## Occurrence Acquisition

Regardless of the level of impact, 17 occurrences will be protected in the Reserve System (**Table 5-16**). Eight occurrences will be incorporated into the Reserve System to improve management and monitoring, and expand each occurrence, if biologically feasible, when portions of Alamaden Quicksilver, Calero, and Santa Teresa County parks are added to the Reserve System. In addition, the Implementing Entity will acquire nine occurrences of most beautiful jewelflower (LAND-P5).

As described in Chapter 4, the impact limit for this species could increase from 6 occurrences, if no additional occurrences are discovered during the permit term, to 8 occurrences, if additional occurrences are discovered during the permit term. A minimum of 2 occurrences have to be acquired prior to any newly discovered occurrence being impacted during the permit term. In other words, a minimum of 14 occurrences will be acquired and protected in the Reserve System before the 7<sup>th</sup> occurrence is impacted and a minimum of 16 occurrences will be acquired and protected in the Reserve System before the 8<sup>th</sup> occurrence is impacted. “Minimums” are referenced here because the Implementing Entity will protect 17 occurrences, regardless of impacts. The timing of acquisition of 12 of the 17 occurrences are linked to impacts, while the remaining 5 occurrences will be acquired for recovery purposes only and thus acquisition timing of these 5 occurrences are not linked to impacts. The newly discovered and protected occurrences must be in better condition than the impacted occurrences, according to the criteria in Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*. In addition, new occurrences must be acquired before the impacts occur and by Year 45 (the deadline for all Reserve System acquisition).

There is a high potential to acquire additional natural populations under the Plan. As stated in section above, there are several “jewelflower” occurrences that have yet to be determined to be Metcalf Canyon jewelflower or most beautiful jewelflower. Some of these occurrences are likely to be most beautiful jewelflower. In order for an occurrence to count as protected under the Plan, there will be a buffer of at least 500 feet between the occurrence and adverse land uses, as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush*.

## Management Techniques and Tools

To successfully manage occurrences of most beautiful jewelflower, targeted studies will be conducted to determine factors that limit occurrence expansion



(STUDIES-5). Such studies may examine factors related to management and microsite needs of the species at all life stages from germination through maturity (STUDIES-5). Adaptive management decisions can then be developed on the basis of monitoring results to mitigate, minimize, or eliminate limiting factors.

The targeted studies will be used to inform the target size for managed occurrences. A preliminary goal of 2,000 individuals per occurrence will be implemented as recommended in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998c); if approved by the Wildlife Agencies, this number will be adjusted as necessary pending research carried out during Plan implementation to assure viable occurrences of this species.

To help implement the Recovery Plan for this species (U.S. Fish and Wildlife Service 1998c), a permanent conservation seed bank for most beautiful jewelflower will be established in the same manner as described for Tiburon Indian paintbrush in Section 5.4.10 *Tiburon Indian Paintbrush* subheading *Management Techniques and Tools* (STUDIES-12).

## Uncertainties and Threats

Most beautiful jewelflower has been studied; however, little is known about its reproductive biology or demography. Herbivory and its impacts on the species are also poorly understood. Because management and conservation decisions for this species are limited in their potential efficacy, the Implementing Entity has little information with which to design and plan specific management and monitoring protocols. Accordingly, directed studies are needed to successfully establish and maintain new occurrences in perpetuity (STUDIES-5).

The age structure and occurrence trends of the extant occurrences of most beautiful jewelflower in the study area are currently unknown. An important management action will be to survey extant occurrences as they are added to the Reserve System and regularly monitor these occurrences to quantify and track the occurrence structure over time (STUDIES-5).

Threats to most beautiful jewelflower are thought to include cattle grazing, competition from invasive nonnative species (notably yellow star-thistle), habitat loss from residential development and road construction, rooting by feral pigs, and disturbance from landfill operations. Studies may be conducted to investigate the details of these threats and the best measures to mitigate them (STUDIES-5).



**Table 5-1a. Biological Goals, Objectives and Conservation Actions: Landscape Level**

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
<b>Goal 1a. Protect and maintain natural and semi-natural landscapes.<sup>1</sup></b>		
<b>Objective 1a.1.</b> Establish a reserve system of at least 46,496 acres and 100 stream miles within the study area (see Figure 5-05 for acquisition target areas by Conservation Analysis Zones). <sup>2,3</sup>	LAND-L1. Acquire in fee title or obtain easements on 100 stream miles within the study area.	Compliance monitoring and annual reports
	LAND-L2a. Acquire in fee title or obtain easements on at least 33,205 acres of land for the Reserve System.	Compliance monitoring and annual reports
	LAND-L2b. Incorporate 13,291 acres of existing open space into the Reserve System.	Compliance monitoring and annual reports
	LAND-L3. Acquire in fee title or obtain easements on streams (100 miles), ponds (50 acres), freshwater wetlands (10 acres), and seasonal wetlands (5 acres) in all watersheds of the study area.	Compliance monitoring and annual reports
<b>Goal 1b. Protect and maintain ecological (natural) processes.</b>		
<b>Objective 1b.1.</b> Protect a range of environmental gradients (such as slope, elevation, aspect, rainfall) across a diversity of natural communities within the Reserve System. <sup>2,3</sup>	LAND-L2c. Acquire in fee title or obtain easements on 33,205 acres of land for the Reserve System that includes the full range of topographic and geographic diversity in the study area.	Compliance monitoring and annual reports
	LAND-L2d. Incorporate 13,291 acres of existing open space into the Reserve System that includes the full range of topographic and geographic diversity in the study area.	Compliance monitoring and annual reports
<b>Goal 2. Maintain or improve opportunities for movement and genetic exchange of native organisms within and between natural communities inside and connecting to areas outside of the study area.<sup>4</sup></b>		
<b>Objective 2.1.</b> Determine wildlife movement across Coyote Creek downstream of Anderson Reservoir, Pacheco Creek (SR 152), and the Pajaro River when adequate monitoring data exist on wildlife movement in the three focal areas or by year 10 of implementation, whichever comes first.	STUDIES-1. Conduct feasibility study to determine wildlife movement across Coyote Creek downstream of Anderson Reservoir, Pacheco Creek (SR 152), and the Pajaro River.	Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
<b>Objective 2.2.</b> Protect and enhance important habitat linkages for covered species and other native species within the Reserve System and protect connectivity to habitat outside the study area (Figure 5-6 and Table 5-9). <sup>2</sup>	LAND-L4. Acquire and enhance natural and semi-natural landscapes between the Santa Teresa Hills and Metcalf Canyon to the south that will contribute to providing connectivity between the Santa Cruz Mountains and the Diablo Range to promote the movement of covered and other native species at many spatial scales (Linkage 10 in Table 5-9 and Figure 5-6).	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LAND-L5. Acquire in fee title or obtain easements on 2,900 acres of serpentine grassland along Coyote Ridge to link existing protected areas and to create a large core reserve for serpentine grassland species to move within (Linkage 6 in Table 5-9 and Figure 5-6). These acreages are inclusive of, not in addition to, acquisition targets set in LAND-G3.	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LAND-L6. Acquire in fee title or obtain easements on at least 3,000 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities south of Henry W. Coe State Park to link this core reserve with extensive wetlands surrounding San Felipe Lake in San Benito County (Linkage 14 in Table 5-9 and Figure 5-6).	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.

Table 5-1a. Continued

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
<b>Objective 2.3.</b> Increase the permeability of Highway 152 for species movement across Pacheco Creek and Highway 152 from the Highway 152/156 interchange east to the Santa Clara/Merced county line with structures that have the potential to most benefit movement of a variety of native species by year 20 (Linkage 15 in Figure 5-6 and Table 5-9). <sup>6,7</sup>	LAND-L7. Acquire in fee title or obtain easements on at least 2,300 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities in the NE corner of the study area to link the core reserve that includes Joseph Grant County Park with SFPUC lands and other protected lands in Alameda County (Linkage 4 in Table 5-9 and Figure 5-6).	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LAND-L8. Acquire in fee title or obtain easements on at least 500 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities to connect Almaden Quicksilver County Park with protected open space to the east near Calero Lake (Linkage 9 in Table 5-9 and Figure 5-6).	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LAND-L9. Acquire in fee title or obtain easements on 2,000 acres of conifer woodland, riparian forest & scrub, oak woodland, and grassland natural communities, in the portion of the Pescadero Watershed that is in the study area and along the Pajaro River, to maintain wildlife connections between the Santa Cruz Mountains and the Gabilan Range outside the study area (Linkages 18, 19, and 20 in Table 5-9 and Figure 5-6).	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LAND-L10. Acquire in fee title or obtain easements on serpentine grassland along Coyote Ridge to protect the connection between Silver Creek and Kirby Canyon (Linkage 6 in Table 5-9 and Figure 5-6) as part of the acquisition targets set in LAND-G3.	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
	LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	Compliance monitoring for infrastructure/structure removal, replacement, or installation.

Table 5-1a. Continued

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
	LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
<b>Objective 2.4.</b> Increase the permeability for species movement across Santa Clara Valley between the Diablo Range and the Santa Cruz Mountains and between Coyote Ridge and Diablo Range to the Santa Cruz Mountains via Coyote Valley, Tulare Hill, or Fisher Creek with structures that have the potential to most benefit movement of a variety of covered and other native species by year 20 (Linkages 8 and 10 in Figure 5-6 and Table 5-9). <sup>6</sup>	LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
<b>Objective 2.5</b> (not used)		
<b>Objective 2.6.</b> Increase the permeability for species movement from the Santa Cruz Mountains to the Pajaro River with structures that have the potential to most benefit movement of a variety of covered and other native species by year 20 (Linkage 18, 19, and 20 in Figure 5-6 and Table 5-9). <sup>6</sup>	LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.

Table 5-1a. Continued

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
	LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
<b>Objective 2.7.</b> Increase the permeability for species movement from Highway 152 to the confluence with the Pajaro River with structures that have the potential to most benefit movement of a variety of covered and other native species by year 20 (Linkages 12 in Figure 5-6 and Table 5-9). <sup>6</sup>	LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.

Table 5-1a. Continued

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
	LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
<b>Goal 3.</b> Enhance or restore representative natural and semi-natural landscapes to maintain or increase native biological diversity.		
<b>Objective 3.1.</b> To increase the total area of quality habitat for covered and other native species and to improve hydrologic function, enhance 33,205 acres of terrestrial and aquatic land cover types and 100 miles of streams, and restore 1 mile of stream and restore or create 90 acres of aquatic land cover types within the Reserve System. If all predicted impacts occur, restore 10.4 miles of streams and restore or create 501 acres of aquatic land cover types within the Reserve System. <sup>3</sup>	LM-6. Enhance or restore an estimated 17,440 acres of grassland, 2,500 acres of chaparral and northern coastal scrub, 12,900 acres of oak woodland, 290 acres of riparian forest and scrub, and 10 acres of conifer woodland within the Reserve System.	Compliance monitoring with additional monitoring for effectiveness of restoration/enhancement/creation developed at natural community level.
	LM-7a. Restore a minimum of 1.0 miles of stream, 50 acres of riparian forest and scrub, and 20 acres of freshwater marsh, and create 20 acres of ponds to contribute to species recovery.	Compliance monitoring. Monitor baseline hydrologic function against future changes.
	LM-7b. If all predicted impacts occur, restore 10.4 miles of streams, 339 acres of riparian forest and scrub, 45 acres of freshwater marsh, and 30 acres of seasonal wetlands, and create 72 acres of ponds within all watersheds of the study area to maintain and when necessary improve stream hydrologic functions.	Compliance monitoring. Monitor baseline hydrologic function against future changes.
<b>Objective 3.2a.</b> Ensure natural fire disturbance regimes required for natural community regeneration and structural diversity, and covered species germination and recruitment occur within the Reserve System or implement management actions that mimic those natural disturbances through development of a fire management component of each reserve unit management plan. <sup>3,8</sup>	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Compliance monitoring including effects of burning monitored as part of natural community enhancement. For management actions that mimic natural fire regimes, compare post-fire vegetation to baseline conditions at periodic intervals to assess the effect of various fire frequencies and intensities at promoting native plants and reducing non-native plants. Monitor target covered species response.
	LM-9. In identified “no burn” areas implement the biologically appropriate management actions that mimic the natural effects of fire (e.g., mowing, grazing, hand pulling) to subsequently improve habitat for native vegetation.	Analyze and quantify effectiveness of burning vs. other management actions in increasing diversity and quantity of native vegetation. Monitor target covered species response, if applicable.

Table 5-1a. Continued

Biological Goals and Objectives	Conservation Actions <sup>1,2</sup>	Monitoring Action
<b>Objective 3.2b.</b> Ensure natural flooding disturbance regimes required for natural community regeneration and structural diversity, and covered species germination and recruitment occur within the Reserve System or implement management actions that mimic those natural disturbances through adoption of the SCVWD Natural Flood Protection Plan (2000). <sup>3</sup>	LM-10. Integrate adopted policies for natural flood protection (i.e., Ordinance O6-1, <i>Clean, Safe Creeks and Natural Flood Protection Plan</i> , <i>Coyote Watershed Stream Stewardship Plan</i> ) into flood protection projects to protect habitat for covered fish, amphibians, and reptiles.	Compliance monitoring
<b>Objective 3.3.</b> Eradicate or reduce the cover, biomass, and distribution of existing target, non-native invasive plants and reduce the number and distribution of non-native, invasive animals to enhance natural communities and covered species habitat within the Reserve System. <sup>3</sup>	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Analyze and quantify numbers of pigs eradicated and evidence of remaining population (e.g., pig observations or signs of damage).
	LM-13. Eradicate or reduce nonnative predators (bullfrogs, invasive fish, feral cats) within the Reserve System through habitat manipulation (e.g., periodic draining of ponds), trapping, hand capturing, electroshocking or other control methods to achieve targets identified in reserve unit management plans.	Monitor response of nonnative predators to habitat manipulation and assess efficacy of various techniques.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	STUDIES-2. Experimentally manage oak woodlands to reduce seedling mortality, increase seedling and sapling survival and determine factors relevant to regeneration, including browsing by mammals, birds, and insects.	Monitor research results.

## Notes:

<sup>1</sup> Habitat enhancement, monitoring, and adaptive management program, will continue in perpetuity. Restoration and creation must occur in rough step with impacts as required by the Stay-Ahead provision (see Chapter 8, Section 8.6.1). All habitat restoration will be completed by Year 40.

<sup>2</sup> Land acquisition must occur in rough step with impacts as required by the Stay-Ahead provision (see Chapter 8, Section 8.6.1). All land acquisition must be complete by Year 45. Land acquisition requiring restoration or creation of habitat for Covered Species must be complete by Year 40.

<sup>3</sup> See Tables 5-4 and Figure 5-4. Existing open space requirements for the Reserve System may be substituted with new acquisition in addition to the minimum of 33,205 acres of new acquisition required by the Plan.

<sup>4</sup> Excerpted from NCCP Act and revised for the Plan.

<sup>6</sup> Specific locations and structures will be identified as part of a feasibility study.

<sup>7</sup> Design will be based on the best available science and be consistent with Condition 6 described in Chapter 6, Section 6.4.4, subheading *Condition 6 Design and Construction Requirements for Covered*

<sup>8</sup> Fire management will be incorporated into the reserve unit management plans within 5 years of the first acquisition of the land for the reserve unit.



**Table 5-1b.** Biological Goals, Objectives, and Conservation Actions: Natural Community Level

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Grassland</b>		
<b>Goal 4.</b> Maintain and enhance grassland communities that benefit covered species and promote native biodiversity.		
<b>Objective 4.1.</b> Protect 4,130 acres of serpentine grassland containing the full range of serpentine grassland associations and species including serpentine seeps and serpentine rock outcrops as part of the Reserve System within the study area. <sup>1</sup>	LAND-G1. Acquire 4,130 acres of serpentine grassland by fee title or conservation easement with the full range of serpentine grassland associations and vegetation diversity found throughout the study area. This includes 4,000 acres of serpentine bunchgrass grassland, 120 of serpentine rock outcrops/barrens, and 10 acres of serpentine seeps.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 4.2.</b> Protect 13,300 acres of annual grassland in a diversity of soils types and other environmental gradients including areas suitable for enhancing native species, provide a matrix of pond, wetland, and upland habitat, and those containing native grassland as part of the Reserve System within the study area. <sup>1</sup>	LAND-G2. Acquire 13,300 acres of annual grassland by fee title or conservation easement as part of the Reserve System. Target areas on both sides of Santa Clara Valley with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored. Acquisition of native grassland will be given priority.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 4.3a.</b> Reduce cover and biomass of non-native plants. <sup>2</sup>	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of burning on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species responses.
	GRASS-3. Conduct mowing in selected areas to mimic grazing where use of livestock is impractical.	Monitor effects of mowing on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species response.
	GRASS-4. Conduct selected seeding of native forbs and grasses in the Reserve System.	Monitor success of seeding efforts in promoting native forbs and grasses. Monitor target covered species responses.
	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Compare post-fire vegetation to baseline conditions at periodic intervals to assess the effect of various fire frequencies and intensities at promoting native plants and reducing non-native plants. Monitor target covered species response.
	LM-9. In identified “no burn” areas implement the biologically appropriate management actions that mimic the natural effects of fire (e.g., mowing, grazing, hand pulling) to subsequently improve habitat for native vegetation.	Analyze and quantify effectiveness of burning vs. other management actions in increasing diversity and quantity of native vegetation. Monitor target covered species response, if applicable.
	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 4.3b.</b> Decrease nitrogen deposition in serpentine grasslands to reduce non-native, invasive plant growth.	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of burning on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species responses.
	GRASS-3. Conduct mowing in selected areas to mimic grazing where use of livestock is impractical.	Monitor effects of mowing on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species response.
	GRASS-4. Conduct selected seeding of native forbs and grasses in the Reserve System.	Monitor success of seeding efforts in promoting native forbs and grasses. Monitor target covered species responses.
	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Compare post-fire vegetation to baseline conditions at periodic intervals to assess the effect of various fire frequencies and intensities at promoting native plants and reducing non-native plants. Monitor target covered species response.
<b>Objective 4.3c.</b> Increase the diversity of native plants within the Reserve System. <sup>2</sup>	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of burning on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species responses.
	GRASS-3. Conduct mowing in selected areas to mimic grazing where use of livestock is impractical.	Monitor effects of mowing on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species response.
	GRASS-4. Conduct selected seeding of native forbs and grasses in the Reserve System.	Monitor success of seeding efforts in promoting native forbs and grasses. Monitor target covered species responses.
	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Compare post-fire vegetation to baseline conditions at periodic intervals to assess the effect of various fire frequencies and intensities at promoting native plants. Monitor target covered species response.
	LM-9. In identified “no burn” areas implement the biologically appropriate management actions that mimic the natural effects of fire (e.g., mowing, grazing, hand pulling) to subsequently improve habitat for native vegetation.	Analyze and quantify effectiveness of burning vs. other management actions in increasing diversity and quantity of native vegetation. Monitor target covered species response, if applicable.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 4.4.</b> Increase the distribution and availability of California ground squirrels to increase the prey base for San Joaquin kit fox and to increase burrow availability within grassland for California tiger salamander, California red-legged frog, western burrowing owl, San Joaquin kit fox, and other native species within the Reserve System. <sup>2</sup>	GRASS-5. Prohibit use of rodenticides within the Reserve System, except when needed to protect the integrity of structures, such as levees, stock ponds and dams.	Monitor population trend of California ground squirrels. Track changes in burrowing mammal colony size over time.
	GRASS-6. Introduce livestock grazing where it is not currently used, and where conflicts with covered activities are minimized, to reduce vegetative cover and biomass that currently excludes ground squirrel and encourage ground squirrel colonization of new areas within the Reserve System.	Monitor population trend of California ground squirrels. Analyze and quantify changes in burrowing mammal colony size over time.
<b>Chaparral and Northern Coastal Scrub</b>		
<b>Goal 5.</b> Maintain and enhance functional chaparral and northern coastal scrub communities to benefit covered species and promote native biodiversity.		
<b>Objective 5.1.</b> Protect 2,500 acres of chaparral and northern coastal scrub containing the full range of chaparral and northern coastal scrub community associations and manage it as part of the Reserve System within the study area. <sup>1</sup>	LAND-C1. Acquire 400 acres of northern mixed chaparral/chamise chaparral by fee title or conservation easement.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-C2. Acquire 700 acres of mixed serpentine chaparral by fee title or conservation easement.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-C3. Acquire 1,400 acres of northern coastal scrub/Diablan sage scrub by fee title or conservation easement.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 5.2.</b> Enhance all acquired chaparral and northern coastal scrub land cover types by promoting regeneration and succession to sustain the natural processes and native species diversity found in these communities within the Reserve System. <sup>2</sup>	STUDIES-2. Determine factors relevant to the health and regeneration of native chaparral/scrub species. Targeted studies will be initiated within first 10 years of plan implementation. Use results of targeted studies to revise and improve management actions.	Conduct targeted research that identifies key factors affecting regeneration and succession of chaparral/scrub.
	CHAP-1. Conduct prescribed burns in chaparral and northern coastal scrub to maintain canopy gaps and promote regeneration. Use targeted studies to inform locations and frequency.	Monitor effects of burning on promoting canopy gaps, regeneration, and succession in chaparral and northern coastal scrub.
	CHAP-2. Mechanically thin chaparral and northern coastal scrub to promote structural diversity. Use targeted studies to inform location and frequency.	Monitor effects of mechanical thinning on promoting canopy gaps, regeneration, and succession in chaparral and northern coastal scrub.
	CHAP-3. Identify areas in the Santa Cruz Mountains and eastern mountains where adjacent natural communities (e.g. grassland, oak woodland, conifer forests) are encroaching on chaparral and scrub land cover and, if appropriate, work to reduce the spread through manual reduction.	Analyze and quantify spread of adjacent natural communities into chaparral and scrub land cover types. Study spread rate after manual reduction.
	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Compare post-fire vegetation to baseline conditions at periodic intervals to assess the effect of various fire frequencies and intensities at promoting native plants and reducing non-native plants. Monitor target covered species response.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Oak and Conifer Woodland</b>		
<b>Goal 6.</b> Maintain and enhance functional oak woodland communities to benefit covered species and promote native biodiversity.		
<b>Objective 6.1.</b> Protect 1,700 acres of valley oak woodland, 7,100 acres of mixed oak woodland and forest, 2,900 acres of coast live oak woodland and forest, 1,100 acres of blue oak woodland, 80 acres of foothill pine-oak woodland, and 20 acres of mixed evergreen forest, containing the full range of oak woodland associations and species, and that provide a matrix of pond, wetland, and upland habitat as part of the Reserve System within the study area. <sup>1</sup>	LAND-OC1. Acquire in fee title or obtain conservation easements on 7,100 acres of mixed oak woodland and forest, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-OC2. Acquire 2,900 acres of coast live oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-OC3. Acquire 1,100 acres of blue oak woodland and 1,700 acres of valley oak woodland by fee title or conservation easement including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-OC4. Acquire 80 acres of foothill pine-oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-OC5. Acquire 20 acres of mixed evergreen forest by fee title or conservation easement including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 6.2a.</b> Enhance all acquired oak woodland land cover types by reducing invasive plant and animal species. <sup>2</sup>	LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Monitor effectiveness of pig removal efforts and response of oak woodlands once pigs are removed.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	OAK-1. Conduct prescribed burns in low-density oak woodlands to enhance the community and to reduce non-native, invasive grass cover beneath oaks and encourage growth of a native understory and oak seedlings.	Monitor effects of burning on promoting regeneration and recruitment of oak woodlands and understory land cover. Monitor covered species response.
	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 6.2b.</b> Promote regeneration and recruitment of all acquired oak woodland land cover types by promoting regeneration and recruitment of component species. <sup>2</sup>	OAK-1. Conduct prescribed burns in low-density oak woodlands to enhance the community and to reduce non-native, invasive grass cover beneath oaks and encourage growth of a native understory and oak seedlings.	Monitor effects of burning on promoting regeneration and recruitment of oak woodlands and understory land cover. Monitor covered species response.
	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
<b>Objective 6.2c.</b> Enhance all acquired oak woodland and cover types by sustaining the natural processes found in these communities. <sup>2</sup>	STUDIES-3. Experimentally manage oak woodlands to reduce seedling mortality, increase seedling and sapling survival and determine factors relevant to regeneration, including browsing by mammals, birds, and insects.	Conduct targeted research that identifies key factors affecting seedling mortality, seedling and sapling survival and factors relevant to oak woodland regeneration.
	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
	OAK-1. Conduct prescribed burns in low-density oak woodlands to enhance the community and to reduce non-native, invasive grass cover beneath oaks and encourage growth of a native understory and oak seedlings.	Monitor effects of burning on promoting regeneration and recruitment of oak woodlands and understory land cover. Monitor covered species response.
<b>Goal 7.</b> Maintain and enhance functional conifer woodland communities to benefit covered species and promote native biodiversity.		
<b>Objective 7.1.</b> Protect 10 acres of redwood forest as part of the Reserve System within the study area. <sup>1</sup>	LAND-OC6. Acquire 10 acres of redwood forest by fee title or conservation easement.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 7.2.</b> Enhance all acquired conifer woodland communities by promoting ecologically appropriate structure, density, and species composition to preserve and sustain the natural processes and native species diversity found in these communities. <sup>3</sup>	STUDIES-4. Experimentally manage redwood forest to determine factors relevant to regeneration and maintenance; possibly including prescribed burning, selective thinning, and other management actions to meet this objective.	Conduct targeted research in redwood forest, ponderosa pine woodland, and knobcone pine woodland to guide management actions and other factors relevant to regeneration and maintenance.
	OAK-2. Conduct prescribed burns in redwood forest to maintain or enhance native species diversity in the mid-canopy and understory.	Monitor effects of burning on promoting native species diversity.
	OAK-3. Mechanically thin the understory of redwood forest in target areas to promote a healthy understory/canopy.	Monitor effects of mechanical thinning on regeneration and succession in the understory and canopy of conifer woodlands. Monitor target covered species response, if applicable.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Riverine and Riparian Forest and Scrub</b>		
<b>Goal 8.</b> Improve the quality of streams and the hydrologic and geomorphic processes that support them to maintain a functional aquatic and riparian community to benefit covered species and promote native biodiversity.		
<b>Objective 8.1.</b> Protect 100 miles of streams to promote habitat function, wildlife movement, and stream temperature moderation as part of the Reserve System within the study area. <sup>1, 3</sup>	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
	LAND-R1. Extend the Uvas Creek Park Preserve 1.6 miles upstream to Hecker Pass Highway and setback expected development adjacent to this stream segment by a minimum of 100 feet to protect the Uvas Creek Corridor consistent with Goals 5-5, 5-7, and 5-8 of the approved City of Gilroy Hecker Pass Specific Plan. Target acquisitions will contribute to the protection of a total of 800 acres of riparian woodland and forest in the Uvas, Llagas, and Pacheco watersheds.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 8.2.</b> If all impacts occur, restore 10.4 stream miles on acquired fish bearing stream, as identified in Figure 3-12, within the Reserve System. <sup>2</sup>	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor the efficacy of seeding efforts with respect to structural diversity, overhead cover, and water temperature compared to designated reference locations. Indicator species will be selected and success criteria developed for large-scale restoration projects from the reference locations.
	STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	STREAM-4. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors to promote continuity.
	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
<b>Objective 8.3.</b> Enhance all miles of streams within the Reserve System to promote natural community functions, and habitat heterogeneity and connectivity. <sup>2</sup>	STREAM-4. Replace concrete, earthen or other engineered channels as part of the 10.4 miles of stream restoration to restore floodplain connectivity. Location and length will be determined by site-specific conditions.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	STREAM-5. Replace confined channels to restore floodplain connectivity and commensurate functions as part of the 10.4 miles of stream restoration. Location and length will be determined by site-specific conditions.	Conduct pre- and post-treatment monitoring of community function (performance of ecological processes); habitat composition, structure and pattern; and connectivity as part of a targeted study.
	STREAM-6. Manage watershed-wide fine sediment inputs by conditioning controls on runoff from all development projects (see Condition 3) to improve riverine habitat functions and geomorphic processes.	Conduct annual spot checks on new developments to determine whether sediment run-off provisions are consistent with the Conditions outlined in this Plan.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 9.</b> Maintain a functional riparian forest and scrub community at a variety of successional stages and improve these communities to benefit covered species and promote native biodiversity.		
<b>Objective 9.1.</b> Protect a minimum of 250 acres of large (at least 10 acres), contiguous stands of willow riparian forest and scrub or mixed riparian forest and woodland within the 100-year floodplain to maximize the width of native vegetation below dams to promote habitat function, wildlife movement, and stream temperature moderation as part of the Reserve System within the study area. Up to 578 acres of riparian forest and scrub will be protected if all estimated impacts occur. <sup>1</sup>	LAND-R2. Acquire in fee title or obtain conservation easements on lands that protect at least 250 acres and up to 578 acres of existing willow riparian forest and scrub or mixed riparian forest and woodland, including areas that provide key connectivity between existing riparian habitats in upper Coyote Creek, San Felipe Creek, Uvas Creek, Tar Creek, Little Arthur Creek, and Pacheco Creek.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
<b>Objective 9.2.</b> Protect a minimum of 40 acres of large (at least 10 acres), contiguous stands of Central California sycamore alluvial woodland within the 100-year floodplain to maximize the width of native vegetation below dams to promote habitat function, wildlife movement, and stream temperature moderation as part of the Reserve System within the study area. <sup>1</sup>	LAND-R3. Acquire in fee title or obtain conservation easements on lands that protect at least 40 acres of existing Central California sycamore alluvial woodland to ensure that this very rare and threatened land cover type is preserved in the study area.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
<b>Objective 9.3.</b> Restore an acre of high-quality willow riparian forest and scrub and mixed riparian forest and woodland and two acres of Central California sycamore alluvial woodland at a variety of successional stages within the Reserve System for every acre removed by covered activities (up to 339 acres of willow and mixed riparian forest and up to 14 acres of sycamore woodland if all impacts occur). <sup>2</sup>	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor the efficacy of seeding efforts with respect to structural diversity, overhead cover, and water temperature compared to designated reference locations. Indicator species will be selected and success criteria developed for large-scale restoration projects from the reference locations.
	STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	STREAM-4. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors to promote continuity.
<b>Objective 9.4.</b> Enhance all riparian forest and scrub at a variety of successional stages within the Reserve System. <sup>2</sup>	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
<b>Objective 9.5.</b> Restore at least 50 acres of willow riparian forest and scrub and mixed riparian woodland to increase available habitat species and enhance connectivity within the Reserve System to contribute to species recovery. <sup>2</sup>	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor the efficacy of seeding efforts with respect to structural diversity, overhead cover, and water temperature compared to designated reference locations. Indicator species will be selected and success criteria developed for large-scale restoration projects from the reference locations.
	STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	STREAM-4. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors to promote continuity.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Wetland and Pond</b>		
<b>Goal 10.</b> Maintain, enhance, and create or restore functional pond, freshwater perennial wetland, and seasonal wetland habitats that benefit covered species and promote native biodiversity.		
<b>Objective 10.1.</b> Protect a minimum of 10 acres total of perennial wetlands, 5 acres total of seasonal wetlands, and 50 total acres of ponds as part of the Reserve System within the study area to contribute to species recovery, regardless of impacts. <sup>1</sup> Aquatic habitat preserved for the purposes of the Plan must be adjacent to permanently protected upland habitat for covered species.	LAND-WP1a. Acquire in fee title or conservation easement 10 acres of perennial freshwater wetlands suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP2a. Acquire in fee title or conservation easement 5 acres of seasonal freshwater wetlands suitable for covered or native species and/or other seasonal wetlands capable of being enhanced or restored to support covered species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP3a. Acquire in fee title or conservation easement 50 acres of ponds suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 10.2.</b> Protect up to 50 acres of perennial wetlands, 30 acres of seasonal wetlands, and 104 acres of ponds as part of the Reserve System if all estimated impacts occur. <sup>1</sup> Aquatic habitat preserved for the purposes of the Plan must be adjacent to permanently protected upland habitat for covered species	LAND-WP1b. Acquire in fee title or conservation easement up to 50 acres of perennial freshwater wetlands suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP2b. Acquire in fee title or conservation easement up to 30 acres of seasonal freshwater wetlands suitable for covered or native species and/or other seasonal wetlands capable of being enhanced or restored to support covered species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP3b. Acquire in fee title or conservation easement up to 104 acres of ponds suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 10.3.</b> As determined by covered and native species needs, enhance all freshwater and seasonal wetlands and ponds by increasing native vegetative cover, biomass, and structural diversity in and around the margins within five years of pond or wetland acquisition within the Reserve System. <sup>2</sup>	POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	Monitor effectiveness of fencing to exclude livestock and feral pigs and compare vegetation inside of fencing to vegetation outside of fencing. Evaluate success of wetland and pond enhancement using established success criteria.
	POND-2. Install woody debris around perimeter and in submerged banks of ponds and wetlands to create basking habitat and cover for native juvenile amphibians and turtles. Materials imported from outside of the watershed shall be treated for chytrid and other potential pathogens prior to installation.	Analyze and quantify effectiveness of created basking site through routine monitoring in ponds with known western pond turtle occupancy.
	POND-3. Plant native emergent vegetation around the perimeter and in ponds and wetlands.	Monitor survivorship of planting, quantify vegetated perimeter of pond, describe habitat quality and periodically survey for species response from covered amphibians and reptiles. Evaluate success of wetland and pond enhancement using established success criteria.
	POND-4. Clear vegetation and/or remove sediment in a way that minimizes negative effects on covered species when vegetation and/or sediment restricts the ability of the aquatic environment from meeting the biological goals and objectives of the Plan.	Evaluate success of wetland and pond enhancement using established success criteria.



Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Analyze and quantify numbers of pigs eradicated and evidence of remaining population (e.g., pig observations or signs of damage).
<b>Objective 10.4.</b> Enhance all ponds by reducing the cover and biomass of non-native, invasive plants in the adjacent uplands between the functional perimeter of the ponds and within 0.5 miles. Pond enhancement will begin immediately after reserve unit management plans are completed or updated for each reserve unit. <sup>2</sup>	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Evaluate success of wetland and pond enhancement using established success criteria.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Evaluate success of wetland and pond enhancement using established success criteria.
	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor research results.
	POND-3. Plant native emergent vegetation around the perimeter and in ponds and wetlands.	Monitor survivorship of planting, quantify vegetated perimeter of pond, describe habitat quality and periodically survey for species response from covered amphibians and reptiles. Evaluate success of wetland and pond enhancement using established success criteria.
	POND-5. If biologically appropriate, graze or mechanically thin around pond perimeter to mimic grazing and promote native species.	Evaluate success of wetland and pond enhancement using established success criteria.
<b>Objective 10.5.</b> Enhance all ponds and wetlands within the Reserve System by eradicating or reducing density of exotic species by 95% that are detrimental to native pond and wetland biodiversity to increase number of ponds and wetlands occupied by covered species. Wetland and pond enhancement will begin immediately after reserve unit management plans are completed or updated for each reserve unit. <sup>2</sup>	LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Analyze and quantify numbers of pigs eradicated and evidence of remaining population (e.g., pig observations or signs of damage).
	LM-13. Eradicate or reduce nonnative predators (bullfrogs, invasive fish, feral cats) within the Reserve System through habitat manipulation (e.g., periodic draining of ponds), trapping, hand capturing, electroshocking or other control methods to achieve targets identified in reserve unit management plans.	Monitor response of nonnative predators to habitat manipulation. Evaluate effect of predator abatement on native pond and wetland biodiversity. Determine presence of covered species.
	POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	Monitor effectiveness of fencing to exclude livestock and feral pigs and compare vegetation inside of fencing to vegetation outside of fencing. Evaluate success of wetland and pond enhancement using established success criteria.
<b>Objective 10.6.</b> Restore at least 20 acres of freshwater and seasonal wetlands to increase available habitat species and enhance connectivity among existing ponds and wetlands for covered species within the Reserve System to contribute to species recovery. <sup>2</sup>	POND-6. Restore 20 acres of perennial freshwater marsh within the Reserve System in suitable sites and those likely to support covered species.	Compliance monitoring. Monitor freshwater marsh and wetland restoration and assess whether success criteria are being met. Assess connectivity of restored complexes.
<b>Objective 10.7.</b> In addition to the restoration of wetlands described in <b>Objective 10.6</b> , restore up to 55 acres of perennial freshwater and seasonal wetlands in-kind within the Reserve System to increase available habitat and enhance connectivity among existing ponds and wetlands for covered species if all anticipated impacts occur. <sup>2</sup>	POND-7. In addition to the perennial freshwater marsh restoration described in <b>POND-6</b> , restore up to 25 acres of perennial freshwater marsh within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	Compliance monitoring. Monitor freshwater marsh and wetland restoration and assess whether success criteria are being met. Assess connectivity of restored complexes.
	POND-8. Restore up to 30 acres of seasonal wetlands within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	Compliance monitoring. Monitor freshwater marsh and wetland restoration and assess whether success criteria are being met. Assess connectivity of restored complexes.

Table 5-1b. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 10.8.</b> Create at least 20 acres of ponds at 40 sites to increase available covered species habitat and enhance connectivity among existing ponds and wetlands within the Reserve System. <sup>2</sup>	POND-9. Create at least 20 acres of ponds at 40 sites, at least 10 sites in the Santa Cruz Mountains and 20 sites in the Diablo Range.	Compliance monitoring. Monitor pond construction and assess whether success criteria are being met.
<b>Objective 10.9.</b> In addition to the creation of ponds described in <b>Objective 10.8</b> , create up to 52 acres of ponds in-kind within the Reserve System to increase the amount available habitat and enhance connectivity among existing ponds and wetlands if all anticipated impacts occur. <sup>2</sup>	POND-10. In addition to the creation of ponds described in POND-9, create up to 52 acres of ponds in-kind within the Reserve System to increase the amount available habitat and enhance connectivity among existing ponds and wetlands if all anticipated impacts occur. <sup>3</sup>	Compliance monitoring. Monitor pond construction and assess whether success criteria are being met.
<p>Notes:</p> <p><sup>1</sup> Land acquisition must occur in rough step with impacts as required by the Stay-Ahead provision (see Chapter 8, Section 8.6.1). All land acquisition must be complete by Year 45. Section 5.3 of the Plan provides more detail on areas targeted for acquisition for each natural community. Reserve lands will be managed in accordance with reserve unit management plans, completed within 5 years of the acquisition of the 1st parcel within the reserve unit. The conservation strategy for aquatic land cover types includes preservation/enhancement, restoration, and/or creation. See Tables 5-14 and 5-15 for details.</p> <p><sup>2</sup> Habitat enhancement, monitoring, and adaptive management program, will continue in perpetuity. Restoration and creation must occur in rough step with impacts as required by the Stay Ahead provision (see Chapter 8, Section 8.6.1). All habitat restoration will be completed by Year 40 unless otherwise noted in this table. Reserve lands will be managed in accordance with reserve unit management plans, completed within 5 years of the acquisition of the 1st parcel within the reserve unit. The conservation strategy for aquatic land cover types are three fold and include preservation/enhancement, restoration, and/or creation. See Tables 5-14 and 5-15 for details.</p> <p><sup>3</sup> Watershed-specific targets are established for certain stream reaches within each watershed.</p>		

**Table 5-1c.** Biological Goals, Objectives and Conservation Actions: Wildlife

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 11.</b> Improve the viability of existing Bay checkerspot butterfly populations, increase the number of populations, and expand the geographic distribution to ensure the long-term persistence of the species in the study area.		
<b>Objective 11.1.</b> Protect 4,554 acres of modeled Bay Checkerspot butterfly habitat, including 4,000 acres of serpentine grasslands in core populations of Bay checkerspot butterfly, to protect a range of slopes, aspects, and microhabitats as part of the Reserve System within the study area. <sup>1</sup>	LAND-G3. Acquire in fee title or obtain conservation easements on 4,000 acres of suitable serpentine grassland habitat along ridges for Bay checkerspot butterfly on Silver Creek Hills, Coyote Ridge, Pigeon Point, Tulare Hill, Santa Theresa Hills, areas west of Calero Reservoir, and the Kalanas, and Hale/Falcon Crest in fee title or conservation easement. Habitat acquisition on Coyote Ridge and Tulare Hill is top priority. For other sites totaling 554 acres, prioritize sites, threat, patch size, current occupancy and prevalence of cool microsites for Bay checkerspot butterflies.	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management according to threat, patch size, current occupancy and prevalence of cool microsites for Bay checkerspot butterflies.
	LAND-L5. Acquire in fee title or obtain easements on 2,900 acres of serpentine grassland along Coyote Ridge to link existing protected areas and to create a large core reserve for serpentine grassland species to move within (Linkage 6 in Table 5-9 and Figure 5-6). These acreages are inclusive of, not in addition to, acquisition targets set in LAND-G3.	Compliance monitoring for land acquisition. Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
<b>Objective 11.2.</b> Increase the number of larval host plant populations and adult nectar sources and reduce the amount of thatch to a level that supports the long term viability of the Bay checkerspot butterfly on sites with degraded serpentine grassland within the Reserve System. <sup>2</sup>	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on increasing larval host plants and numbers of Bay checkerspot butterflies.
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of prescribed burns on increasing larval host plants and numbers of Bay checkerspot butterflies.
	GRASS-3. Conduct mowing in selected areas to mimic grazing where use of livestock is impractical.	Monitor effects of mowing on larval host plants, adult host plants, numbers of Bay checkerspot butterflies, and non-native invasive plant species.
<b>Objective 11.3</b> Decrease nitrogen deposition in serpentine grassland to reduce non-native, invasive plant growth in the Reserve System.	GRASS-4. Conduct selected seeding of native forbs and grasses in the Reserve System.	Monitor effects of mowing on larval host plants, adult host plants, numbers of Bay checkerspot butterflies, and non-native invasive plant species.
	GRASS-7. Implementing Entity will initiate translocation efforts if natural colonization fails after five seasons in which core populations are at above-average population sizes. Through coordination with species experts and regulatory agencies translocate Bay checkerspot butterflies (eggs, larvae, or adults) from core populations into suitable but unoccupied sites if natural dispersal fails to reestablish population.	Monitor at periodic intervals the success of translocation efforts in establishing new populations of Bay checkerspot butterfly.
	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor relationship between nonnative plant abundance and Bay checkerspot butterfly.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 13.</b> Increase the size and sustainability of the breeding population and increase the distribution of breeding and wintering burrowing owls in the study area and the expanded burrowing owl conservation area.		
<b>Objective 13.1.</b> Protect 21,310 acres of modeled western burrowing owl overwintering habitat (i.e., grassland, oak woodland, or barren land) and protect or manage 5,300 acres of nesting habitat (occupied or potential) on the valley floor and in the Diablo Range within the permit area. The geographic breakdown should be: 3,700 acres in the North San Jose/Baylands region, 800 acres in the Gilroy region, 530 acres in the Morgan Hill region, and 270 acres in the South San Jose region as shown in Figure 5-10. Prioritize sites that contain occupied burrowing owl breeding sites. Management agreements on non-reserve lands may be placed on up to 4,700 acres of the 5,300 acres of nesting habitat.	LAND-G6. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles the San Jose Water Pollution Control Plant Bufferlands, north of Highway 237.	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.
	LAND-G7. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles of the San Jose International Airport or other important northern San Jose breeding sites.	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.
	LAND-G8. Acquire or obtain easements on 21,310 acres of suitable overwintering habitat in the Diablo Range that support ground squirrel populations or could support them with improved management. This acreage is in addition to of the targets identified in LAND-G6 and LAND-G7.	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.
<b>Objective 13.2.</b> Enhance through improved management 3,700 acres of burrowing owl nesting habitat in the North San Jose/Baylands burrowing owl conservation region, 800 acres in the Gilroy burrowing owl conservation region, 530 acres in the Morgan Hill burrowing owl conservation region, and 270 acres in the South San Jose burrowing owl conservation region to encourage expansion of burrowing owls within the permit area. <sup>2</sup>	GRASS-5. Prohibit use of rodenticides within the Reserve System, except when needed to protect the integrity of structures, such as levees, stock ponds and dams.	Monitor population trend (i.e., number, density, range) of California ground squirrels in target areas.
	GRASS-6. Introduce livestock grazing where it is not currently used, and where conflicts with covered activities are minimized, to reduce vegetative cover and biomass that currently excludes ground squirrel and encourage ground squirrel colonization of new areas within the Reserve System.	Identify candidate grassland sites within the Reserve System to provide expansion areas for ground squirrel colonies.
	GRASS-8. Implement vegetation management (i.e., graze/mow) that reduces vegetation height and density to optimal conditions for burrowing owls.	Monitor status of burrowing owl population and correlate species response to vegetation management.
<b>Objective 13.3.</b> Establish a positive growth trend for burrowing owls in the permit area by Year 15 of the permit term and maintain the positive growth trend for each year thereafter.	GRASS-9. Create and maintain artificial burrows to encourage colonization of sites where ground squirrels establishment is not feasible or during the interim before ground squirrel colonies naturally establish.	Monitor artificial burrow for occupancy twice annually, during the breeding season.
	LAND-G6. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles the San Jose Water Pollution Control Plant Bufferlands, north of Highway 237.	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.
	LAND-G7. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles of the San Jose International Airport or other important northern San Jose breeding sites.	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	LAND-G8. Acquire or obtain easements on 21,310 acres of suitable overwintering habitat in the Diablo Range that support ground squirrel populations or could support them with improved management. This acreage is in addition to of the targets identified in	Compliance monitoring and yearly reporting. Monitor presence/absence of burrowing owl in target areas.
	GRASS-5. Prohibit use of rodenticides within the Reserve System, except when needed to protect the integrity of structures, such as levees, stock ponds and dams.	Monitor population trend (i.e., number, density, range) of California ground squirrels in target areas.
	GRASS-6. Introduce livestock grazing where it is not currently used, and where conflicts with covered activities are minimized, to reduce vegetative cover and biomass that currently excludes ground squirrel and encourage ground squirrel colonization of new areas within the	Identify candidate grassland sites within the Reserve System to provide expansion areas for ground squirrel colonies.
	GRASS-8. Implement vegetation management (i.e., graze/mow) that reduces vegetation height and density to optimal conditions for burrowing owls.	Monitor status of burrowing owl population and correlate species response to vegetation management.
	GRASS-9. Create and maintain artificial burrows to encourage colonization of sites where ground squirrels establishment is not feasible or during the interim before ground squirrel colonies naturally establish.	Monitor artificial burrow for occupancy twice annually, during the breeding season.
<b>Goal 14.</b> Increase the ability of San Joaquin kit fox to move into and within the study area and provide habitat to increase the likelihood of breeding.		
<b>Objective 14.1.</b> Protect 4,100 acres of annual grassland and suitable oak woodland land cover types in a diversity of soils types and other environmental gradients to improve San Joaquin kit fox movement and potential breeding habitat as part of the Reserve System within the study area. <sup>1</sup>	LAND-G9. Acquire in fee title or obtain easements on 4,100 acres of annual grassland and suitable oak woodland types (e.g., oak savanna and oak woodland within 500 feet of annual grassland) north and south of Highway 152 in modeled San Joaquin kit fox habitat.	Compliance monitoring and yearly reporting. Monitor presence/absence of kit fox in target areas.
<b>Objective 14.2.</b> Increase the population size and density of the prey base for San Joaquin kit fox. <sup>2</sup>	GRASS-5. Prohibit use of rodenticides within the Reserve System, except when needed to protect the integrity of structures, such as levees, stock ponds and dams.	Monitor population trend (i.e., number, density, range) of California ground squirrels in target areas.
	GRASS-6. Introduce livestock grazing where it is not currently used, and where conflicts with covered activities are minimized, to reduce vegetative cover and biomass that currently excludes ground squirrel and encourage ground squirrel colonization of new areas within the Reserve System.	Identify candidate grassland sites within the Reserve System to provide expansion areas for ground squirrel colonies.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 14.3.</b> Educate the public about land management techniques that are compatible with kit fox movement within the southeastern portion of the study area. <sup>2</sup>	GRASS-10. Conduct at least one public education campaign in the southeastern portion of the study area within the first 10 years of implementation to provide landowners with information about management and land use techniques that are more compatible with movement and use by San Joaquin kit fox. Conduct additional meetings as needed.	Ensure that at least one educational meeting is conducted within the first two years of implementation and then as needed after that.
<b>Objective 14.4.</b> Increase the number of undercrossings, by a minimum of one, that are considered passable and safe for San Joaquin kit fox or increase the safety of at least two existing crossings across Highway 152 between the Highway 152/156 interchange and the Santa Clara/Merced County line. Identify target crossings by conducting a feasibility study by year 5 of Plan implementation (see Objective 2.1). <sup>2, 3</sup>	LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
	LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	Monitor wildlife movement in target areas. Monitor movement of indicator species for connectivity.
	LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	Compliance monitoring. Monitor wildlife movement in target areas. Monitor movement of indicator species for connectivity.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 15.</b> Provide for the expansion of a breeding population of least Bell's vireos into the study area and increase reproductive success of least Bell's vireo.		
<b>Objective 15.1.</b> Protect 462 acres of modeled Least Bell's vireo habitat (i.e., riparian woodland or forest with a dense understory (<3m tall) in the Uvas, Llagas, Pajaro, or Pacheco Watersheds in south Santa Clara County) as part of the Reserve System. <sup>1</sup> Target areas will contain occupied or potential least Bell's vireo habitat.	LAND-R1. Extend the Uvas Creek Park Preserve 1.6 miles upstream to Hecker Pass Highway and setback expected development adjacent to this stream segment by a minimum of 100 feet to protect the Uvas Creek Corridor consistent with Goals 5-5, 5-7, and 5-8 of the approved City of Gilroy Hecker Pass Specific Plan. Target acquisitions will contribute to the protection of a total of 800 acres of riparian woodland and forest in the Uvas, Llagas, and Pacheco watersheds.	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
<b>Objective 15.2.</b> Restore a minimum of 50 acres of riparian woodland and forest and up to 339 acres in the Uvas, Llagas, or Pacheco Watersheds within the Reserve System. <sup>2</sup> Target areas that contain occupied or potential least Bell's vireo habitat.	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor survivorship of plantings/seedlings as part of restoration and enhancement efforts and periodically survey for species response from least Bell's vireo, yellow-legged frog and other covered species.
	STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	Monitor survivorship of plantings/seedlings as part of restoration and enhancement efforts and periodically survey for species response from least Bell's vireo, yellow-legged frog and other covered species.
	STREAM-4. Replace concrete, earthen or other engineered channels as part of the 10.4 miles of stream restoration to restore floodplain connectivity. Location and length will be determine by site-specific conditions.	Compliance monitoring. Conduct pre- and post-treatment monitoring of riparian vegetation as part of a targeted study.
	STREAM-5. Replace confined channels to restore floodplain connectivity and commensurate functions as part of the 10.4 miles of stream restoration. Location and length will be determine by site-specific conditions.	Compliance monitoring. Conduct pre- and post-treatment monitoring of riparian vegetation as part of a targeted study.
<b>Objective 15.3.</b> Reduce the abundance of nest predators in target areas (i.e., occupied and potential habitat) in order to increase reproductive success of least Bell's vireo in riparian areas within the Reserve System. <sup>2</sup>	STREAM-7. Implement a brown-headed cowbird control program in coordination with species experts and regulatory agencies that will reduce the impact of brood parasitism on least Bell's vireo nest success, if least Bell's vireos become regular nesters in the study area (>3 nests over at least two consecutive years) and brown-headed cowbird eggs are discovered in vireo nests.	Compliance monitoring. Monitor for riparian song bird nesting within least Bell's vireo modeled habitat. Periodically, every 5 years, monitor for least Bell's vireo outside of modeled habitat to document range expansion. Quantify the number of occurrences of brood parasitism that are occurring and if/when brown-headed cowbird control program is initiated and efficacy of program.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 16.</b> Conserve existing populations of the foothill yellow-legged frog population where possible and increase the overall population of foothill yellow-legged frog in biologically appropriate locations in the study area.		
<b>Objective 16.1.</b> Protect 104 stream miles of modeled foothill yellow-legged frog habitat that currently have, or historically had, perennial flows as part of the Reserve System within the study area. <sup>1</sup> Target streams that contain occupied or potential foothill yellow-legged frog habitat.	LAND-R5. Acquire or obtain easements along 104 miles of perennial streams located above Uvas, Calero, Chesbro, Anderson, or in Uvas Creek below Uvas Reservoir, Upper Penitencia Creek, Alamitos Creek or Guadalupe Creek that have or could be restored to have cobblestone substrate and consistent, gentle flows from late March to late May.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
<b>Objective 16.2.</b> Enhanced all acquired stream miles and restore 10.4 stream miles of perennial streams located above Uvas, Calero, Chesbro, Anderson, or Coyote Reservoirs or in Uvas Creek below Uvas Reservoir, Upper Penitencia Creek, Alamitos Creek or Guadalupe Creek. <sup>2</sup> Target streams that contain occupied or potential foothill yellow-legged frog habitat.	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor survivorship of plantings/seedlings as part of restoration and enhancement efforts and periodically survey for species response from least Bell's vireo, yellow-legged frog and other covered species.
	STREAM-4. Replace concrete, earthen or other engineered channels as part of the 10.4 miles of stream restoration to restore floodplain connectivity. Location and length will be determine by site-specific conditions.	Compliance monitoring. Conduct pre- and post-treatment monitoring of in-stream habitat as part of a targeted study.
	STREAM-5. Replace confined channels to restore floodplain connectivity and commensurate functions as part of the 10.4 miles of stream restoration. Location and length will be determine by site-specific conditions.	Compliance monitoring. Conduct pre- and post-treatment monitoring of floodplain function as part of a targeted study.
	STREAM-8. Increase the amount of cobblestone substrate suitable to support breeding foothill yellow-legged frogs to 2,000 ft. to areas close to known occurrence(s) of foothill yellow-legged frog or immediately upstream or downstream of known occurrences or other high quality foothill yellow-legged frog breeding habitat.	Assess yellow-legged frog response to increase in cobblestone substrate as part of a targeted study.
	STUDIES-6. Conduct a directed study to censuses egg masses in breeding habitat downstream of reservoirs before and after releases to determine whether eggs masses were lost.	Monitor effects of pulse flows on foothill yellow-legged frog.



Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 17:</b> Conserve existing populations of California red-legged frog, California tiger salamander, and western pond turtle populations where possible, and increase the number of individuals and expand the overall distribution of populations of these species in biologically appropriate locations within the study area to maintain viable populations and contribute to the regional recovery of these species.		
<b>Objective 17.1.</b> Protect California red-legged frog modeled primary (1,430 acres) and secondary (41,800) habitat, California tiger salamander modeled breeding (195 acres) and non-breeding (41,700 acres) habitat, and western pond turtle primary (9,800 acres) and secondary (29,100 acres) habitat as part of the Reserve System within the study area. Aquatic habitat will only be protected if adjacent upland habitat suitable for the terrestrial needs of these species are also protected. <sup>1, 4</sup>	LAND-WP4. Acquire habitat that is adjacent to permanently protected aquatic resources with a high potential to support CRLF and is in the East San Francisco Bay Recovery Unit for red-legged frog ( <i>USFWS 2002</i> ) (Coyote Creek, Pacheco, and Pescadero Watersheds).	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP5. Acquire habitat that contains a matrix of aquatic and upland habitats and is also adjacent to Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, southeast of Henry Coe State Park, Santa Cruz Mountain foothills, and Calero County Park in areas where dense forest is absent to reduce competition with other native amphibians (e.g., California newts).	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP6a. Acquire stream segments or ponds that currently provide or could provide high quality basking, breeding, and nesting habitat (vegetated banks and at least 150 feet of adjacent upland habitat) for western pond turtle.	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-WP6b. Acquire stream segments or ponds that currently provide or could provide high quality basking, breeding, and nesting habitat (vegetated banks and at least 0.5 miles of adjacent upland habitat) for California tiger salamander.	Monitor the removal of barriers within the reserve system to ensure that the highest priority barriers are removed first. Analyze and quantify any potential positive (native fish movement) and negative (spread of exotic species) effects of barrier removal during targeted study phase of implementation.
<b>Objective 17.2.</b> Protect corridors between existing protected areas to ensure genetic exchange within and movement between populations of covered amphibians and aquatic reptiles as part of the Reserve System within the study area. <sup>1</sup> Target corridors include Linkages 4, 5, 12, 13, 14, 15, and 16 (Table 5-6, Figure 5-6).	LAND-WP7. Acquire habitat near Santa Teresa Hills and Tulare Hill to provide connectivity between populations in the Diablo Range and the Santa Cruz foothills.	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
	LAND-G2. Acquire 13,300 acres of annual grassland by fee title or conservation easement as part of the Reserve System. Target areas on both sides of Santa Clara Valley with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored. Acquisition of native grassland will be given priority.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	LAND-OC1. Acquire in fee title or obtain conservation easements on 7,100 acres of mixed oak woodland and forest, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.
	LAND-OC2. Acquire 2,900 acres of coast live oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.
	LAND-OC3. Acquire 1,100 acres of blue oak woodland and 1,700 acres of valley oak woodland by fee title or conservation easement including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.
	LAND-OC4. Acquire 80 acres of foothill pine-oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.
	LAND-OC5. Acquire 20 acres of mixed evergreen forest by fee title or conservation easement including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	Compliance monitoring and yearly reporting. Assess use by covered amphibians and aquatic reptiles and experimentally manage to improve habitat for movement.
<b>Objective 17.3.</b> Enhance a minimum of 50 acres of ponds, 15 acres of wetlands, and 100 miles of streams in the Reserve System by eradicating or reducing exotic species and competitor species (such as nonnative pet-store turtles) that are detrimental to covered amphibians, aquatic reptiles, and native pond biodiversity. Enhance up to 104 acres of ponds and 80 acres of wetlands if all estimated impacts occur. <sup>2</sup>	LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Conduct surveys every 5 years in areas of traditionally high feral pig populations to determine what the population levels are relative to baseline. Monitor response of California red-legged frog, California tiger salamander, and western pond turtle to control of exotic and competitor species as part of a targeted study.
	LM-13. Eradicate or reduce nonnative predators (bullfrogs, invasive fish, feral cats) within the Reserve System through habitat manipulation (e.g., periodic draining of ponds), trapping, hand capturing, electroshocking or other control methods to achieve targets identified in reserve unit management plans.	Monitor response of nonnative predators to habitat manipulation. Monitor response of California red-legged frog, California tiger salamander, and western pond turtle to control of exotic and competitor species

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
	STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	Monitor the efficacy of seeding efforts with respect to structural diversity, overhead cover, and water temperature compared to designated reference locations. Indicator species will be selected and success criteria developed for large-scale restoration projects from the reference locations.
	STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	STREAM-4. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors to promote continuity.
	POND-11. Offer financial and regulatory (Safe Harbor Agreement) incentives to private landowners to enhance pond and wetland habitat to suit breeding California red-legged frog, California tiger salamander, and western pond turtle.	Compliance monitoring.
	POND-12. Educate the public that the use of any salamander species as bait is illegal in the State of California.	Compliance monitoring.
	<b>Objective 17.4.</b> Restore a minimum of 20 acres of perennial wetlands and 1 mile of streams for the California red-legged frog, California tiger salamander, and western pond turtle to maintain or increase breeding populations of covered amphibians and reptiles. Restore up to 45 acres of perennial wetlands, 30 acres of seasonal wetlands, and 10.4 miles of streams if all estimated impacts occur. <sup>2</sup>	
	POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
	POND-2. Install woody debris around perimeter and in submerged banks of ponds and wetlands to create basking habitat and cover for native juvenile amphibians and turtles. Materials imported from outside of the watershed shall be treated for chytrid and other potential pathogens prior to installation.	Analyze and quantify effectiveness of created basking site through routine monitoring in ponds with known western pond turtle occupancy.
	POND-3. Plant native emergent vegetation around the perimeter and in ponds and wetlands.	Monitor survivorship of planting, quantify vegetated perimeter of pond, describe habitat quality and periodically survey for species response from covered amphibians and reptiles. Evaluate success of wetland and pond enhancement using established success criteria.
	POND-4. Clear vegetation and/or remove sediment in a way that minimizes negative effects on covered species when vegetation and/or sediment restricts the ability of the aquatic environment from meeting the biological goals and objectives of the Plan.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	POND-13. Excavate sections of ponds to provide deeper pools that will be utilized by California red-legged frog adults and sub-adults and western pond turtles, while maintaining shallow areas to provide rearing habitat for California red-legged frog tadpoles, California tiger salamander larvae, and western pond turtle hatchlings.	Monitor use of excavated pond by red-legged frog and western pond turtles as part of a targeted study.
	STUDIES-7. In the case of ponds, wetlands, and/ or amphibian populations becoming infected with chytrid fungus or other diseases, use the best scientific information available to manage and stop spread of epidemic.	Monitor for the presence of disease. Monitor efficacy of disease control actions.
	STUDIES-8. Identify the distribution and risk to existing indigenous populations of covered amphibians and reptiles from hybridization (e.g., California tiger salamander hybridizing with Texas salamander) within the Reserve System. Appendix K, California Tiger Salamander Hybridization, will serve as the Management Plan for CTS hybridization issues and will be updated throughout the permit term for adaptive management purposes.	Monitor for the presence of non-natives and hybrids. Test and document efficacy of management plan.
	STUDIES-9. Annually identify and maintain upland breeding sites (even if sites are not “natural”) for western pond turtle because of the high fidelity of use from year to year .	Monitor use of protected sites to determine factors influencing nest success in areas of known turtle use.
	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on increasing habitat for red-legged frog, western pond turtle and California tiger salamander
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of prescribed burning on increasing habitat for red-legged frog, western pond turtle and California tiger salamander
	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor effects of herbicide application on reducing nonnative species and ensure that herbicide use has no unwanted effects on native amphibian population.

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 17.5.</b> Create a minimum of 20 acres of ponds to provide new breeding sites for California red-legged frog, California tiger salamander, and western pond turtle within the Reserve System. Create up to 72 acres of ponds if all estimated impacts occur. <sup>2</sup>	POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	Monitor pond creation and assess whether success criteria are being met. Monitor use of created ponds by covered amphibians and western pond turtle.
	POND-2. Install woody debris around perimeter and in submerged banks of ponds and wetlands to create basking habitat and cover for native juvenile amphibians and turtles. Materials imported from outside of the watershed shall be treated for chytrid and other potential pathogens prior to installation.	Analyze and quantify effectiveness of created basking site through routine monitoring in ponds with known western pond turtle occupancy.
	POND-3. Plant native emergent vegetation around the perimeter and in ponds and wetlands.	Monitor survivorship of planting, quantify vegetated perimeter of pond, describe habitat quality and periodically survey for species response from covered amphibians and reptiles. Evaluate success of wetland and pond enhancement using established success criteria.
	POND-4. Clear vegetation and/or remove sediment in a way that minimizes negative effects on covered species when vegetation and/or sediment restricts the ability of the aquatic environment from meeting the biological goals and objectives of the Plan.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	POND-9. Create at least 20 acres of ponds at 40 sites, at least 10 sites in the Santa Cruz Mountains and 20 sites in the Diablo Range.	Monitor pond creation and assess whether success criteria are being met. Monitor use of created ponds by covered amphibians and western pond turtle.
	POND-10. In addition to the creation of ponds described in POND-9, create up to 52 acres of ponds in-kind within the Reserve System to increase the amount available habitat and enhance connectivity among existing ponds and wetlands if all anticipated impacts occur. <sup>3</sup>	Monitor pond creation and assess whether success criteria are being met. Monitor use of created ponds by covered amphibians and western pond turtle.
	POND-11. Offer financial and regulatory (Safe Harbor Agreement) incentives to private landowners to enhance pond and wetland habitat to suit breeding California red-legged frog, California tiger salamander, and western pond turtle.	Compliance monitoring.
	POND-13. Excavate sections of ponds to provide deeper pools that will be utilized by California red-legged frog adults and sub-adults and western pond turtles, while maintaining shallow areas to provide rearing habitat for California red-legged frog tadpoles, California tiger salamander larvae, and western pond turtle hatchlings.	Monitor use of excavated pond by red-legged frog and western pond turtles as part of a targeted study.
	STUDIES-7. In the case of ponds, wetlands, and/ or amphibian populations becoming infected with chytrid fungus or other diseases, use the best scientific information available to manage and stop spread of epidemic.	Monitor for the presence of disease. Monitor efficacy of disease control actions.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	STUDIES-8. Identify the distribution and risk to existing indigenous populations of covered amphibians and reptiles from hybridization (e.g., California tiger salamander hybridizing with Texas salamander) within the Reserve System. Appendix K, California Tiger Salamander Hybridization, will serve as the Management Plan for CTS hybridization issues and will be updated throughout the permit term for adaptive management purposes.	Monitor for the presence of non-natives and hybrids. Test and document efficacy of management plan.
	STUDIES-9. Annually identify and maintain upland breeding sites (even if sites are not “natural”) for western pond turtle because of the high fidelity of use from year to year .	Monitor use of protected sites to determine factors influencing nest success in areas of known turtle use.
	GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	Monitor effects of various grazing regimes on increasing habitat for red-legged frog, western pond turtle and California tiger salamander
	GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	Monitor effects of prescribed burning on increasing habitat for red-legged frog, western pond turtle and California tiger salamander
	LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
	LM-14. Selectively apply herbicides or other treatments to invasive plants.	Monitor effects of herbicide application on reducing nonnative species and ensure that herbicide use has no unwanted effects on native amphibian population.
<b>Goal 18.</b> Increase the population size of tricolored blackbird to enhance the viability of the species in the study area.		
<b>Objective 18.1.</b> Protect and enhance at least 4 tricolored blackbird breeding sites that support, historically supported, or could support tricolored blackbird colonies as part of the Reserve System within the study area. <sup>1</sup> Each site must include at least 2-acres of breeding habitat and have foraging habitat within 2 miles.	LAND-WP8. Acquire in fee title or through a conservation easement at least 4 tricolored blackbird breeding sites that support, historically supported, or could support tricolored blackbird colonies each with at least 2-acres of breeding habitat and foraging habitat within 2 miles. Target at least 5 acres of suitable breeding habitat for tricolored blackbird within dry land farming or ranching complexes in the Santa Clara Valley and the Diablo Range	Compliance monitoring and yearly reporting. Assess habitat quality of acquired land and prioritize areas for management.
	POND-14. Offer financial or regulatory incentives (Safe Harbor Agreement, if listed) to private landowners to enhance pond and marsh habitat to suit breeding tricolored blackbirds, and to ensure that dry-land farming and ranching activities support breeding tricolored blackbirds.	Compliance Monitoring.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 18.2.</b> Protect and enhance 200 acres of suitable tricolored blackbird foraging habitat within 2 miles of protected and occupied breeding sites as part of the Reserve System within the study area. <sup>1</sup>	LAND-WP9. Acquire 200 acres of foraging habitat for tricolored blackbird in areas where there are protected breeding sites within 2 miles.	Compliance monitoring and yearly reporting. Monitor presence/absence of foraging habitat.
	POND-15 Offer financial incentives to private landowners to ensure that dry-land farming and ranching activities support foraging tricolored blackbirds.	Compliance Monitoring.
<b>Objective 18.3.</b> Enhance or restore 5 acres of suitable tricolor blackbird breeding habitat in historically/currently occupied areas within the Reserve System. <sup>2</sup>	POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
	POND-16. Restore freshwater marsh, seasonal wetlands, and/or ponds that will support dense reed-like vegetation (cattails) or other native vegetation that will attract nesting tricolored blackbirds.	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.
	POND-17. In areas with non-native vegetation (e.g., Himalayan blackberry) that supports existing tricolored blackbird colonies, initiate a gradual (3-4 year) transition from non-native vegetation to native vegetation that is structurally similar.	Determine areas where tricolored blackbirds are using non-native vegetation and ensure that there is a management plan in place to control the spread of the non-native vegetation and transition the colony to native vegetation if necessary.
	POND-18. Restore up to 30 acres of seasonal wetlands within the Reserve System in the Santa Clara Valley.	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.
	STREAM-4. Replace concrete, earthen or other engineered channels as part of the 10.4 miles of stream restoration to restore floodplain connectivity. Location and length will be determine by site-specific conditions.	Compliance monitoring. Conduct pre- and post-treatment monitoring of riparian vegetation as part of a targeted study.
<b>Objective 18.4.</b> Restore a minimum of 20 acres of freshwater wetland suitable for tricolored blackbird breeding habitat within 2 miles of suitable and foraging habitat to encourage colonization of new sites within the Reserve System. Restore up to 45 acres of freshwater wetlands if all estimated impacts occur. <sup>2</sup> The acreage targets in this objective are inclusive of targets identified in Objective 20.3.	POND-19. Restore a minimum of 20 acres and up to 45 acres of freshwater marsh within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.

Table 5-1c. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 18.5.</b> Create a minimum of 20 acres of ponds to provide new nest colony sites for tricolored blackbird within the Reserve System. Create up to 72 acres of ponds if all estimated impacts occur. <sup>2</sup>	POND-9. Create at least 20 acres of ponds at 40 sites, at least 10 sites in the Santa Cruz Mountains and 20 sites in the Diablo Range.	Monitor pond creation and assess whether success criteria are being met. Monitor use of created ponds by covered amphibians, western pond turtle, and tricolored blackbird.
	POND-10. In addition to the creation of ponds described in POND-9, create up to 52 acres of ponds in-kind within the Reserve System to increase the amount available habitat and enhance connectivity among existing ponds and wetlands if all anticipated impacts occur. <sup>3</sup>	Monitor pond creation and assess whether success criteria are being met. Monitor use of created ponds by covered amphibians, western pond turtle, and tricolored blackbird.

## Notes:

<sup>1</sup> Land acquisition must occur in rough step with impacts as required by the Stay-Ahead provision (see Chapter 8, Section 8.6.1). All land acquisition must be completed by Year 45. Section 5.4 of the Plan provides more detail on areas targeted for acquisition for each species. Reserve lands will be managed in accordance with reserve unit management plans, completed within 5 years of the acquisition of the 1st parcel within the reserve unit.

<sup>2</sup> Habitat enhancement, monitoring, and adaptive management program, will continue in perpetuity. Restoration and creation must occur in rough step with impacts as required by the Stay Ahead provision (see Chapter 8, Section 8.6.1). All habitat restoration will be completed by year 40 unless otherwise noted in this table. Reserve lands will be managed in accordance with reserve unit management plans, completed within 5 years of the acquisition of the 1st parcel within the reserve unit. All plans will be reviewed and approved by the Wildlife Agencies. The conservation strategy for aquatic land cover types includes preservation/enhancement, restoration, and/or creation. See Tables 5-14 and 5-15 for details.

<sup>3</sup> Design will be based on the best available science and be consistent with Condition 6 described in Chapter 6, Section 6.4.4, subheading *Condition 6 Design and Construction Requirements for Covered Transportation Projects*

<sup>4</sup> These occupied acreages are minimum requirements for each species that utilizes each referenced land cover type.



**Table 5-1d. Biological Goals, Objectives and Conservation Actions: Plants**

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Goal 20.</b> Maintain viability, protect, and increase the size and number of populations of covered serpentine plant species, including Coyote ceanothus, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, fragrant fritillary, Mt. Hamilton thistle, Loma Prieta hoita, and Tiburon Indian paintbrush, within the study area. <sup>1</sup>		
<b>Objective 20.1.</b> Protect and enhance the known extant occurrences of Coyote ceanothus as part of the Reserve System within the study area, including a buffer zone of 500 feet around each occurrence to reduce external influences and a minimum occurrence size of 5,000 individuals. <sup>4,5,7</sup>	LAND-P1. Acquire in fee title or conservation easement sites in the study area that support three unprotected occurrences of Coyote ceanothus and provide the necessary buffer between incompatible land uses.	Compliance monitoring and annual reports.
	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor results of research and the effects of its application.
	STUDIES-11. Conduct experimental burning in protected occurrences of targeted covered plant species to determine the importance of fire for plant regeneration.	Monitor burning on known occurrences of Coyote ceanothus and species response.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
	CHAP-1. Conduct prescribed burns in chaparral and northern coastal scrub to maintain canopy gaps and promote regeneration. Use targeted studies to inform locations and frequency.	Monitor burning on known occurrences of Coyote ceanothus and species response.
	CHAP-2. Mechanically thin chaparral and northern coastal scrub to promote structural diversity. Use targeted studies to inform location and frequency.	Monitor the impacts of grazing or other vegetation management techniques on known occurrences of Coyote ceanothus.
	LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Monitor all covered plants following a wildfire.

Table 5-1d. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 20.2.</b> Establish two new occurrences of Coyote ceanothus in the Reserve System to reduce risk of extinction. Conduct targeted studies to determine feasibility of occurrence creation and identify locations and propagation/planting techniques. <sup>6</sup>	STUDIES-13. Identify suitable locations for and establish target number of new covered plant occurrences in the Reserve System.	Compliance monitoring and annual reports.
	STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	Monitor newly established and source occurrences.
	STUDIES-15. Design and implement field experiments (if the number of propagules will not be significantly impacted) to test alternative techniques for establishment of targeted covered plant occurrences. Field experiments will be continue until target number of occurrences are established.	Monitor the results of all experiments.
<b>Objective 20.3.</b> Protect at least 55 occurrences of Santa Clara Valley dudleya as part of the Reserve System within the study area, including a buffer zone of 500 feet around each occurrence to reduce external influences and promote expansion of occurrences. <sup>2,4,5</sup>	LAND-P2. Acquire in fee title or conservation easement sites in the study area that support 55 occurrences of Santa Clara Valley dudleya across a range of elevational gradients on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.4.</b> Increase the size of Santa Clara Valley dudleya occurrences to ensure each occurrence has at least 2,000 individuals within the Reserve System. <sup>4,6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on Santa Clara Valley dudleya
	STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Monitor the effects of grazing on management on covered plant species.

Table 5-1d. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 20.5.</b> Protect at least three currently unprotected occurrences and adequate lands to create ten new occurrences of Metcalf Canyon jewelflower, including a buffer zone of 500 feet around each occurrence to reduce external influences and promote expansion of occurrences. <sup>4,5</sup>	LAND-P3. Acquire in fee title or conservation easement sites in the study area that support three occurrences of Metcalf Canyon jewelflower.	Compliance Monitoring; Yearly Reports
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.6.</b> Create at least ten new occurrences and expand the size of all Metcalf Canyon jewelflower occurrences in the Reserve System to at least 2,000 individuals. <sup>4,6,7</sup>	LAND-P4. Acquire north side of Tulare Hill to promote reintroduction of Metcalf Canyon jewelflower on west side of Valley.	Compliance Monitoring; Yearly Reports
	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on Metcalf Canyon jewelflower
	STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	Monitor newly established and source occurrences.
	STUDIES-15. Design and implement field experiments (if the number of propagules will not be significantly impacted) to test alternative techniques for establishment of targeted covered plant occurrences. Field experiments will be continue until target number of occurrences are established.	Monitor the results of all experiments.
	STUDIES-17. Monitor Metcalf Canyon jewelflower and most beautiful jewelflower introgression and develop protocols to protect the genetic integrity of both species.	Monitor the results of research and success of developed protocols.
<b>Objective 20.7.</b> Protect at least 17 occurrences of most beautiful jewelflower, including a buffer zone of 500 feet around each occurrence to reduce external influences and promote expansion of occurrence. <sup>4,5</sup>	LAND-P5. Acquire sites in the study area that support 17 occurrences of most beautiful jewelflower.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.

Table 5-1d. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	STUDIES-17. Monitor Metcalf Canyon jewelflower and most beautiful jewelflower introgression and develop protocols to protect the genetic integrity of both species.	Monitor the results of research and success of developed protocols.
<b>Objective 20.8.</b> Increase the size of most beautiful jewelflower occurrences to ensure each occurrence has at least 2,000 individuals. <sup>4,6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on most beautiful jewelflower
	STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	Monitor newly established and source occurrences.
<b>Objective 20.9.</b> Protect at least 22 occurrences of Mount Hamilton thistle as part of the Reserve System within the study area, including a buffer zone of 500 feet around each occurrence to reduce external influences and promote expansion of occurrence. <sup>3,4,5</sup>	LAND-P6. Acquire sites in the study area that support Mount Hamilton thistle in drainages or spring systems and stratify protection on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.10.</b> Increase the size of Mt. Hamilton thistle occurrences within the Reserve System to at least 2,000 individuals to ensure each occurrence has a viable number of individuals each year. Conduct targeted studies to determine feasibility of expanding occurrences. <sup>4,6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on Mt. Hamilton thistle.
	STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Monitor the effects of grazing on management on covered plant species.

Table 5-1d. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 20.11.</b> Protect at least 12 occurrences of smooth lessingia as part of the Reserve System within the study area, including a buffer zone of 150-meter (500 foot) buffer around each occurrence to reduce external influences and promote expansion of occurrences. <sup>4,5</sup>	LAND-P7. Acquire sites in the Reserve System that support eight occurrences of smooth lessingia.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.12.</b> Locate or create at least 12 new occurrences of smooth lessingia and increase the size of all occurrence to ensure each occurrence has at least 2,000 individuals within the Reserve System. <sup>4,6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on smooth lessingia.
	STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	
	STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Monitor the effects of grazing on management on covered plant species.
<b>Objective 20.13.</b> Protect at least four occurrences of fragrant fritillary as part of the Reserve System within the study area, including a buffer zone of 500 feet around each occurrence to reduce external influences and promote expansion of occurrences. <sup>5</sup>	LAND-P8. Acquire sites along Coyote Ridge that support the four remaining unprotected fragrant fritillary occurrences.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.14.</b> Increase the size of fragrant fritillary occurrences within the Reserve System to ensure each occurrence has a viable number of individuals each year. <sup>7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on fragrant fritillary.

Table 5-1d. Continued

Biological Goals and Objectives	Conservation Actions	Monitoring Action
	STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Monitor the effects of grazing on management on covered plant species.
<b>Objective 20.15.</b> Protect the one known occurrence of Tiburon Indian Paintbrush within the permit area that is not currently permanently protected as part of the Reserve System, including a buffer zone of 500 feet around each occurrence to reduce external influences. <sup>4</sup>	LAND-P9. Acquire the Tiburon Indian paintbrush occurrence located at the Kirby Canyon landfill mitigation site prior to or at the time the temporary conservation easement expires.	
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.
<b>Objective 20.16.</b> Increase the size of the protected Tiburon Indian paintbrush occurrence within the Reserve System to ensure occurrence has at least 2,000 individuals. <sup>4,6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on Tiburon Indian paintbrush.
	STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Monitor the effects of grazing on management on covered plant species.
<b>Goal 21.</b> Protect and increase the size and number of Loma Prieta hoita within the study area.		
<b>Objective 21.1</b> (not used)		
<b>Objective 21.2</b> (not used)		
<b>Objective 21.3</b> (not used)		
<b>Objective 21.4</b> (not used)		
<b>Objective 21.5</b> (not used)		
<b>Objective 21.6</b> (not used)		
<b>Objective 21.7.</b> Protect four currently unprotected occurrences of Loma Prieta hoita in the study area as part of the Reserve System including a buffer zone of 500 feet around each occurrence to reduce external influences. <sup>4,5</sup>	LAND-P11. Acquire four sites in the study area that supports Loma Prieta hoita.	Compliance monitoring and annual reports.
	STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Monitor viability of seed collection and refresh collection, as necessary.

Biological Goals and Objectives	Conservation Actions	Monitoring Action
<b>Objective 21.8.</b> Increase the size of protected Loma Prieta hoita occurrences within the Reserve System. <sup>6,7</sup>	STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Monitor the results and application of research on Loma Prieta hoita.

## Notes:

<sup>1</sup> For the purposes of this Plan, a plant occurrence is defined as a group of individuals that are separated by at least 0.25 mile from other groups of individuals of the same species or subspecies, consistent with how plants are tracked by the CNDDDB. In some cases, an occurrence may be equivalent to a population; in other cases, multiple occurrences may form a single population. A biological population is defined differently for each of the covered plants and is often unknown due to a lack of population data. Therefore, an occurrence provides a single standard by which to measure impacts and conservation for all covered plants. During implementation, the Implementing Entity may conduct monitoring or management actions based on populations, which is a more biologically meaningful unit.

<sup>2</sup> Objectives that require protection of plant occurrence require that those occurrences be in currently unprotected land.

<sup>3</sup> For Mount Hamilton thistle population on the east side of Coyote Valley are defined as all occurrences in a discrete drainage; while population on the west side of Coyote Valley are defined as each occurrence point.

<sup>4</sup> Source for buffer width and minimum population size: USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (1998c)

<sup>5</sup> Land acquisition must occur in rough step with impacts as required by the Stay Ahead provision (see Chapter 8, Section 8.6.1). All land acquisition must be complete by Year 45. Land acquisition requiring restoration or creation of habitat for Covered Species must be complete by Year 40. Reference Table 5-29 for interim land acquisition timelines.

<sup>6</sup> Habitat enhancement, monitoring, and adaptive management program, will continue in perpetuity. Restoration and creation must occur in rough step with impacts as required by the Stay-Ahead provision (see Chapter 8, Section 8.6.1). All habitat restoration will be completed by year 40.

<sup>7</sup> The target number of individuals per occurrence will be adjusted or established as necessary pending research carried out during Plan implementation to assure viable occurrences of each covered plant species.

**Table 5-2a. Land Acquisition Actions**

Acquisition Action	Target Species
<b>Landscape (L)</b>	
LAND-L1. Acquire in fee title or obtain easements on 100 stream miles within the study area.	All covered species
LAND-L2a. Acquire in fee title or obtain easements on at least 33,205 acres of land for the Reserve System.	All covered species
LAND-L2b. Incorporate 13,291 acres of existing open space into the Reserve System.	All covered species
LAND-L2c. Acquire in fee title or obtain easements on 33,205 acres of land for the Reserve System that includes the full range of topographic and geographic diversity in the study area.	All covered species
LAND-L2d. Incorporate 13,291 acres of existing open space into the Reserve System that includes the full range of topographic and geographic diversity in the study area.	All covered species
LAND-L3. Acquire in fee title or obtain easements on streams (100 miles), ponds (50 acres), freshwater wetlands (10 acres), and seasonal wetlands (5 acres) in all watersheds of the study area.	California red-legged frog, California tiger salamander, western pond turtle, least Bell's vireo,
LAND-L4. Acquire and enhance natural and semi-natural landscapes between the Santa Teresa Hills and Metcalf Canyon to the south that will contribute to providing connectivity between the Santa Cruz Mountains and the Diablo Range to promote the movement of covered and other native species at many spatial scales (Linkage 10 in Table 5-9 and Figure 5-6).	Bay checkerspot butterfly, covered serpentine plants
LAND-L5. Acquire in fee title or obtain easements on 2,900 acres of serpentine grassland along Coyote Ridge to link existing protected areas and to create a large core reserve for serpentine grassland species to move within (Linkage 6 in Table 5-9 and Figure 5-6). These acreages are inclusive of, not in addition to, acquisition targets set in LAND-G3.	Bay checkerspot butterfly, covered serpentine plants, western burrowing owl
LAND-L6. Acquire in fee title or obtain easements on at least 3,000 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities south of Henry W. Coe State Park to link this core reserve with extensive wetlands surrounding San Felipe Lake in San Benito County (Linkage 14 in Table 5-9 and Figure 5-6).	San Joaquin kit fox, California tiger salamander, California red-legged frog



Table 5-2a. Continued

Acquisition Action	Target Species
LAND-L7. Acquire in fee title or obtain easements on at least 2,300 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities in the NE corner of the study area to link the core reserve that includes Joseph Grant County Park with SFPUC lands and other protected lands in Alameda County (Linkage 4 in Table 5-9 and Figure 5-6).	California tiger salamander, California red-legged frog
LAND-L8. Acquire in fee title or obtain easements on at least 500 acres of grassland, chaparral & coastal scrub, and oak woodland natural communities to connect Almaden Quicksilver County Park with protected open space to the east near Calero Lake (Linkage 9 in Table 5-9 and Figure 5-6).	California tiger salamander, California red-legged frog, western pond turtle
LAND-L9. Acquire in fee title or obtain easements on 2,000 acres of conifer woodland, riparian forest & scrub, oak woodland, and grassland natural communities, in the portion of the Pescadero Watershed that is in the study area and along the Pajaro River, to maintain wildlife connections between the Santa Cruz Mountains and the Gabilan Range outside the study area (Linkages 18, 19, and 20 in Table 5-9 and Figure 5-6).	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-L10. Acquire in fee title or obtain easements on serpentine grassland along Coyote Ridge to protect the connection between Silver Creek and Kirby Canyon (Linkage 6 in Table 5-9 and Figure 5-6) as part of the acquisition targets set in LAND-G3.	Bay checkerspot butterfly, covered serpentine plants
<b>Grassland (G)</b>	
LAND-G1. Acquire 4,130 acres of serpentine grassland by fee title or conservation easement with the full range of serpentine grassland associations and vegetation diversity found throughout the study area. This includes 4,000 acres of serpentine bunchgrass grassland, 120 of serpentine rock outcrops/barrens, and 10 acres of serpentine seeps.	Covered serpentine plants, Bay checkerspot butterfly
LAND-G2. Acquire 13,300 acres of annual grassland by fee title or conservation easement as part of the Reserve System. Target areas on both sides of Santa Clara Valley with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored. Acquisition of native grassland will be given priority.	California tiger salamander, western burrowing owl

Table 5-2a. Continued

Acquisition Action	Target Species
LAND-G3. Acquire in fee title or obtain conservation easements on 4,000 acres of suitable serpentine grassland habitat along ridges for Bay checkerspot butterfly on Silver Creek Hills, Coyote Ridge, Pigeon Point, Tulare Hill, Santa Theresa Hills, areas west of Calero Reservoir, and the Kalanas, and Hale/Falcon Crest in fee title or conservation easement. Habitat acquisition on Coyote Ridge and Tulare Hill is top priority. For other sites totaling 554 acres, prioritize sites, threat, patch size, current occupancy and prevalence of cool microsites for Bay checkerspot butterflies.	Covered serpentine plants, Bay checkerspot butterfly
LAND-G4. (not used)	
LAND-G5. (not used)	
LAND-G6. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles the San Jose Water Pollution Control Plant Bufferlands, north of Highway 237.	western burrowing owl, San Joaquin kit fox, California tiger salamander
LAND-G7. Acquire, obtain easements, or retain management agreements on burrowing owl nesting habitat within 2 miles of the San Jose International Airport or other important northern San Jose breeding sites.	western burrowing owl
LAND-G8. Acquire or obtain easements on 21,310 acres of suitable overwintering habitat in the Diablo Range that support ground squirrel populations or could support them with improved management. This acreage is in addition to of the targets identified in LAND-G6 and LAND-G7.	western burrowing owl, San Joaquin kit fox, California tiger salamander
LAND-G9. Acquire in fee title or obtain easements on 4,100 acres of annual grassland and suitable oak woodland types (e.g., oak savanna and oak woodland within 500 feet of annual grassland) north and south of Highway 152 in modeled San Joaquin kit fox habitat.	western burrowing owl, San Joaquin kit fox, California tiger salamander
<b>Chaparral and Northern Coastal Scrub ( C )</b>	
LAND-C1. Acquire 400 acres of northern mixed chaparral/chamise chaparral by fee title or conservation easement.	California tiger salamander
LAND-C2. Acquire 700 acres of mixed serpentine chaparral by fee title or conservation easement.	California tiger salamander
LAND-C3. Acquire 1,400 acres of northern coastal scrub/Diablan sage scrub by fee title or conservation easement.	California tiger salamander

Table 5-2a. Continued

Acquisition Action	Target Species
<b>Oak and Conifer Woodland (OC)</b>	
LAND-OC1. Acquire in fee title or obtain conservation easements on 7,100 acres of mixed oak woodland and forest, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	western burrowing owl, San Joaquin kit fox, California tiger salamander, California red-legged frog
LAND-OC2. Acquire 2,900 acres of coast live oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	western burrowing owl, San Joaquin kit fox, California tiger salamander, California red-legged frog
LAND-OC3. Acquire 1,100 acres of blue oak woodland and 1,700 acres of valley oak woodland by fee title or conservation easement including land in both the Santa Cruz Mountains and the Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	western burrowing owl, San Joaquin kit fox, California tiger salamander, California red-legged frog
LAND-OC4. Acquire 80 acres of foothill pine-oak woodland and forest by fee title or conservation easement, including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	western burrowing owl, San Joaquin kit fox, California tiger salamander, California red-legged frog
LAND-OC5. Acquire 20 acres of mixed evergreen forest by fee title or conservation easement including land in both the Santa Cruz Mountains and Diablo Range. Target areas with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored.	California tiger salamander, California red-legged frog, foothill yellow-legged frog
LAND-OC6. Acquire 10 acres of redwood forest by fee title or conservation easement.	California tiger salamander, California red-legged frog, foothill yellow-legged frog

Table 5-2a. Continued

Acquisition Action	Target Species
<b>Riverine and Riparian Forest and Scrub ( R )</b>	
LAND-R1. Extend the Uvas Creek Park Preserve 1.6 miles upstream to Hecker Pass Highway and setback expected development adjacent to this stream segment by a minimum of 100 feet to protect the Uvas Creek Corridor consistent with Goals 5-5, 5-7, and 5-8 of the approved City of Gilroy Hecker Pass Specific Plan. Target acquisitions will contribute to the protection of a total of 800 acres of riparian woodland and forest in the Uvas, Llagas, and Pacheco watersheds.	California red-legged frog, California tiger salamander, western pond turtle, foothill yellow-legged frog, least Bell's vireo
LAND-R2. Acquire in fee title or obtain conservation easements on lands that protect at least 250 acres and up to 578 acres of existing willow riparian forest and scrub or mixed riparian forest and woodland, including areas that provide key connectivity between existing riparian habitats in upper Coyote Creek, San Felipe Creek, Uvas Creek, Tar Creek, Little Arthur Creek, and Pacheco Creek.	California red-legged frog, California tiger salamander, western pond turtle, foothill yellow-legged frog, least Bell's vireo
LAND-R3. Acquire in fee title or obtain conservation easements on lands that protect at least 40 acres of existing Central California sycamore alluvial woodland to ensure that this very rare and threatened land cover type is preserved in the study area.	California red-legged frog, California tiger salamander, western pond turtle, foothill yellow-legged frog, least Bell's vireo
LANS-R4. (not used)	
LAND-R5. Acquire or obtain easements along 104 miles of perennial streams located above Uvas, Calero, Chesbro, Anderson, or in Uvas Creek below Uvas Reservoir, Upper Penitencia Creek, Alamitos Creek or Guadalupe Creek that have or could be restored to have cobblestone substrate and consistent, gentle flows from late March to late May.	California red-legged frog, California tiger salamander, western pond turtle, foothill yellow-legged frog, least Bell's vireo
<b>Wetland and Pond (WP)</b>	
LAND-WP1a. Acquire in fee title or conservation easement 10 acres of perennial freshwater wetlands suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP1b. Acquire in fee title or conservation easement up to 50 acres of perennial freshwater wetlands suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird

Table 5-2a. Continued

Acquisition Action	Target Species
LAND-WP2a. Acquire in fee title or conservation easement 5 acres of seasonal freshwater wetlands suitable for covered or native species and/or other seasonal wetlands capable of being enhanced or restored to support covered species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP2b. Acquire in fee title or conservation easement up to 30 acres of seasonal freshwater wetlands suitable for covered or native species and/or other seasonal wetlands capable of being enhanced or restored to support covered species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP3a. Acquire in fee title or conservation easement 50 acres of ponds suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP3b. Acquire in fee title or conservation easement up to 104 acres of ponds suitable for covered or native species in the Santa Cruz Mountains, Santa Clara Valley, and the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-G2. Acquire 13,300 acres of annual grassland by fee title or conservation easement as part of the Reserve System. Target areas on both sides of Santa Clara Valley with a high concentration of ponds occupied by covered species or native species and/or other ponds capable of being restored. Acquisition of native grassland will be given priority.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP4. Acquire habitat that is adjacent to permanently protected aquatic resources with a high potential to support CRLF and is in the East San Francisco Bay Recovery Unit for red-legged frog (USFWS 2002) (Coyote Creek, Pacheco, and Pescadero Watersheds).	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP5. Acquire habitat that contains a matrix of aquatic and upland habitats and is also adjacent to Joseph D. Grant County Park, Palassou Ridge Open Space Preserve, southeast of Henry Coe State Park, Santa Cruz Mountain foothills, and Calero County Park in areas where dense forest is absent to reduce competition with other native amphibians (e.g., California newts).	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird

Table 5-2a. Continued

Acquisition Action	Target Species
LAND-WP6a. Acquire stream segments or ponds that currently provide or could provide high quality basking, breeding, and nesting habitat (vegetated banks and at least 150 feet of adjacent upland habitat) for western pond turtle.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP6b. Acquire stream segments or ponds that currently provide or could provide high quality basking, breeding, and nesting habitat (vegetated banks and at least 0.5 miles of adjacent upland habitat) for California tiger salamander.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP7. Acquire habitat near Santa Teresa Hills and Tulare Hill to provide connectivity between populations in the Diablo Range and the Santa Cruz foothills.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP8. Acquire in fee title or through a conservation easement at least 4 tricolored blackbird breeding sites that support, historically supported, or could support tricolored blackbird colonies each with at least 2-acres of breeding habitat and foraging habitat within 2 miles. Target at least 5 acres of suitable breeding habitat for tricolored blackbird within dry land farming or ranching complexes in the Santa Clara Valley and the Diablo Range	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
LAND-WP9. Acquire 200 acres of foraging habitat for tricolored blackbird in areas where there are protected breeding sites within 2 miles.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird
<b>Specific Plant Occurrences (P)</b>	
LAND-P1. Acquire in fee title or conservation easement sites in the study area that support three unprotected occurrences of Coyote ceanothus and provide the necessary buffer between incompatible land uses.	Coyote ceanothus
LAND-P2. Acquire in fee title or conservation easement sites in the study area that support 55 occurrences of Santa Clara Valley dudleya across a range of elevational gradients on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.	Santa Clara Valley dudleya
LAND-P3. Acquire in fee title or conservation easement sites in the study area that support three occurrences of Metcalf Canyon jewelflower.	Metcalf canyon jewelflower
LAND-P4. Acquire north side of Tulare Hill to promote reintroduction of Metcalf Canyon jewelflower on west side of Valley.	Metcalf canyon jewelflower

**Table 5-2a. Continued**

Acquisition Action	Target Species
LAND-P5. Acquire sites in the study area that support 17 occurrences of most beautiful jewelflower.	Most beautiful jewel flower
LAND-P6. Acquire sites in the study area that support Mount Hamilton thistle in drainages or spring systems and stratify protection on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.	Mount Hamilton thistle
LAND-P7. Acquire sites in the Reserve System that support eight occurrences of smooth lessingia.	Smooth lessingia
LAND-P8. Acquire sites along Coyote Ridge that support the four remaining unprotected fragrant fritillary occurrences.	Fragrant fritillary
LAND-P9. Acquire the Tiburon Indian paintbrush occurrence located at the Kirby Canyon landfill mitigation site prior to or at the time the temporary conservation easement expires.	Tiburon Indian paintbrush
LANS-P10. (not used)	
LAND-P11. Acquire four sites in the study area that supports Loma Prieta hoita.	Loma Prieta hoita

**Table 5-2b. Land Management Actions**

Management Action	Target Species	Monitoring Action
<b>Landscape Management (LM)</b>		
LM-1. Remove fences and private roads in areas where they are no longer needed and where their removal could increase the permeability of the study area for wildlife.	San Joaquin kit fox, American badger, Tule elk	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-2. When replacing small culverts ensure that the culvert has a natural bottom and is large enough for larger mammals such as deer and mountain lions to pass, if feasible. Culverts must provide direct movement from one side of the road to the other and ensure that the culvert is visible to the target species (i.e., do not obscure entrance with vegetation). Install fencing or other features that will direct wildlife towards the culvert or other safe crossing within the first 20 years of implementation.	San Joaquin kit fox, western pond turtle, foothill yellow-legged frog	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-3. Where structurally possible, replace culverts with free span bridges to ensure free movement for wildlife under roadways.	San Joaquin kit fox, western pond turtle, foothill yellow-legged frog	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-4. Ensure that median barrier removal and/or median perforations are considered as alternatives during project design.	San Joaquin kit fox, American badger, bobcat	Compliance monitoring for infrastructure/structure removal, replacement, or installation.
LM-5. Remove median barriers or perforate sections of median barriers along roadways to improve successful wildlife crossings and install fencing or other features to direct wildlife to those open sections within first 20 years of implementation. Use feasibility study to determine location and length of barrier removal.	San Joaquin kit fox, mule deer, Tule elk	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-6. Enhance or restore an estimated 17,440 acres of grassland, 2,500 acres of chaparral and northern coastal scrub, 12,900 acres of oak woodland, 290 acres of riparian forest and scrub, and 10 acres of conifer woodland within the Reserve System.	California tiger salamander, western burrowing owl, San Joaquin kit fox, covered plant species	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.



Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
LM-7a. Restore a minimum of 1.0 miles of stream, 50 acres of riparian forest and scrub, and 20 acres of freshwater marsh, and create 20 acres of ponds to contribute to species recovery.	Least Bell's vireo, foothill yellow-legged frog, California red-legged frog, western pond turtle	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-7b. If all predicted impacts occur, restore 10.4 miles of streams, 339 acres of riparian forest and scrub, 45 acres of freshwater marsh, and 30 acres of seasonal wetlands, and create 72 acres of ponds within all watersheds of the study area to maintain and when necessary improve stream hydrologic functions.	Least Bell's vireo, tricolored blackbird, foothill yellow-legged frog, California red-legged frog, western pond turtle	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-8. Negotiate with Cal Fire and other local fire-fighting agencies the use of management response measures for all fire events and fire-dependent ecosystems that minimize impacts to natural communities and covered species while protecting human life and property. All burns will be responded to, and prescribed burns will be conducted, with minimum impact suppression tactics. Burn response will take into consideration ignition location and method, seasonality, weather and availability of suppression forces.	Covered plants, California tiger salamander, western burrowing owl	Compliance monitoring for infrastructure/structure removal, replacement, or installation. Monitor wildlife movement (or plant distribution if applicable) in target areas. Monitor movement of indicator species for connectivity.
LM-9. In identified "no burn" areas implement the biologically appropriate management actions that mimic the natural effects of fire (e.g., mowing, grazing, hand pulling) to subsequently improve habitat for native vegetation.	Covered plants, California tiger salamander, western burrowing owl	Analyze and quantify effectiveness of burning vs. other management actions in increasing diversity and quantity of native vegetation. Monitor target covered species response, if applicable.
LM-10. Integrate adopted policies for natural flood protection (i.e., Ordinance O6-1, Clean, Safe Creeks and Natural Flood Protection Plan, Coyote Watershed Stream Stewardship Plan) into flood protection projects to protect habitat for covered fish, amphibians, and reptiles.	Least Bell's vireo, foothill yellow-legged frog, California red-legged frog, western pond turtle	Compliance monitoring
LM-11. Graze, mow, hand-pull, to reduce non-native invasive plant species, both terrestrial and aquatic, to a level where native plants can reestablish and remain dominant within the Reserve System.	Covered plant species, California tiger salamander, western burrowing owl	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
LM-12. Eradicate or reduce nonnative pig disturbance within the Reserve System through trapping, hunting, or other control methods. Success criteria is achieved through ensuring disturbances by nonnative pigs do not impair the ability of the Reserve System from meeting the biological goals and objectives.	Covered plant California tiger salamander, California red-legged frog, western pond turtle, oak woodlands	Analyze and quantify numbers of pigs eradicated and evidence of remaining population (e.g., pig observations or signs of damage).
LM-13. Eradicate or reduce nonnative predators (bullfrogs, invasive fish, feral cats) within the Reserve System through habitat manipulation (e.g., periodic draining of ponds), trapping, hand capturing, electroshocking or other control methods to achieve targets identified in reserve unit management plans.	California tiger salamander, California red-legged frog, western pond turtle, foothill yellow-legged frog	Monitor response of nonnative predators to habitat manipulation. Evaluate effect of predator abatement on native pond and wetland biodiversity. Determine presence of covered species.
LM-14. Selectively apply herbicides or other treatments to invasive plants.	Covered plants	Monitor status of non-native invasive plants in target eradication areas and assess efficacy of various techniques. Monitor covered species response.
<b>Grassland Management (GRASS)</b>		
GRASS-1. Continue or introduce livestock and native herbivore (e.g., elk) grazing in a variety of grazing regimes.	California tiger salamander, western burrowing owl, San Joaquin kit fox, covered plant species	Monitor effects of various grazing regimes on reducing nonnative plants and increasing diversity and biomass of native plants. In oak woodlands, monitor effects of various grazing regimes on oak woodland regeneration and recruitment. Monitor target covered species responses.
GRASS-2. Conduct prescribed burns. Use targeted studies to inform methods, timing, location, and frequency.	California tiger salamander, western burrowing owl, San Joaquin kit fox, covered plant species	Monitor effects of burning on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species responses.
GRASS-3. Conduct mowing in selected areas to mimic grazing where use of livestock is impractical.	California tiger salamander, western burrowing owl, San Joaquin kit fox, covered plant species	Monitor effects of mowing on reducing nonnative plants and increasing diversity and biomass of native plants. Monitor target covered species response.
GRASS-4. Conduct selected seeding of native forbs and grasses in the Reserve System.	California tiger salamander, western burrowing owl, San Joaquin kit fox, covered plant species	Monitor success of seeding efforts in promoting native forbs and grasses. Monitor target covered species responses.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
GRASS-5. Prohibit use of rodenticides within the Reserve System, except when needed to protect the integrity of structures, such as levees, stock ponds and dams.	California tiger salamander, western burrowing owl, San Joaquin kit fox	Monitor population trend of California ground squirrels. Track changes in burrowing mammal colony size over time.
GRASS-6. Introduce livestock grazing where it is not currently used, and where conflicts with covered activities are minimized, to reduce vegetative cover and biomass that currently excludes ground squirrel and encourage ground squirrel colonization of new areas within the Reserve System.	western burrowing owl, San Joaquin kit fox, California tiger salamander, California red-legged frog	Monitor population trend of California ground squirrels. Analyze and quantify changes in burrowing mammal colony size over time.
GRASS-7. Implementing Entity will initiate translocation efforts if natural colonization fails after five seasons in which core populations are at above-average population sizes. Through coordination with species experts and regulatory agencies translocate Bay checkerspot butterflies (eggs, larvae, or adults) from core populations into suitable but unoccupied sites if natural dispersal fails to reestablish population.	Bay checkerspot butterfly	Monitor at periodic intervals the success of translocation efforts in establishing new populations of Bay checkerspot butterfly.
GRASS-8. Implement vegetation management (i.e., graze/mow) that reduces vegetation height and density to optimal conditions for burrowing owls.	California tiger salamander, covered grassland plants, western burrowing owl	Monitor status of burrowing owl population and correlate species response to vegetation management.
GRASS-9. Create and maintain artificial burrows to encourage colonization of sites where ground squirrels establishment is not feasible or during the interim before ground squirrel colonies naturally establish.	Western burrowing owl	Monitor artificial burrow for occupancy twice annually, during the breeding season.
GRASS-10. Conduct at least one public education campaign in the southeastern portion of the study area within the first 10 years of implementation to provide landowners with information about management and land use techniques that are more compatible with movement and use by San Joaquin kit fox. Conduct additional meetings as needed.	San Joaquin kit fox	Ensure that at least one educational meeting is conducted within the first two years of implementation and then as needed after that.
<b>Chaparral and Northern Coastal Scrub Management (CHAP)</b>		
CHAP-1. Conduct prescribed burns in chaparral and northern coastal scrub to maintain canopy gaps and promote regeneration. Use targeted studies to inform locations and frequency.	California tiger salamander, California red-legged frog, western pond turtle, western burrowing owl, Coyote ceanothus	Monitor effects of burning on promoting canopy gaps, regeneration, and succession in chaparral and northern coastal scrub.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
CHAP-2. Mechanically thin chaparral and northern coastal scrub to promote structural diversity. Use targeted studies to inform location and frequency.	California tiger salamander, California red-legged frog, western pond turtle, western burrowing owl, Coyote ceanothus	Monitor effects of mechanical thinning on promoting canopy gaps, regeneration, and succession in chaparral and northern coastal scrub.
CHAP-3. Identify areas in the Santa Cruz Mountains and eastern mountains where adjacent natural communities (e.g. grassland, oak woodland, conifer forests) are encroaching on chaparral and scrub land cover and, if appropriate, work to reduce the spread through manual reduction.		Analyze and quantify spread of adjacent natural communities into chaparral and scrub land cover types. Study spread rate after manual reduction.
<b>Oak and Conifer Woodland Management (OAK)</b>		
OAK-1. Conduct prescribed burns in low-density oak woodlands to enhance the community and to reduce non-native, invasive grass cover beneath oaks and encourage growth of a native understory and oak seedlings.	California tiger salamander, California red-legged frog, western pond turtle	Monitor effects of burning on promoting regeneration and recruitment of oak woodlands and understory land cover. Monitor covered species response.
OAK-2. Conduct prescribed burns in redwood forest to maintain or enhance native species diversity in the mid-canopy and understory.	California tiger salamander, California red-legged frog, western pond turtle, San Joaquin kit fox	Monitor effects of burning on promoting native species diversity.
OAK-3. Mechanically thin the understory of redwood forest in target areas to promote a healthy understory/canopy.	California tiger salamander, California red-legged frog	Monitor effects of mechanical thinning on regeneration and succession in the understory and canopy of conifer woodlands. Monitor target covered species response, if applicable.
<b>Riverine and Riparian Forest and Scrub Management (STREAM)</b>		
STREAM-1. Exclude livestock access to target stream segments (e.g., Pacheco Creek, floodplain of Coyote Creek) using exclusion fencing, off-channel water sources, and other potential actions.	California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo	Conduct pre- and post-treatment monitoring to document vegetation and covered-species response to exclusion.
STREAM-2. Plant and/or seed in native understory and overstory riparian vegetation within 15 feet of the edge of the low-flow channel to create structural diversity, provide overhead cover, and moderate water temperature at all riparian restoration sites.	California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo	Monitor the efficacy of seeding efforts with respect to structural diversity, overhead cover, and water temperature compared to designated reference locations. Indicator species will be selected and success criteria developed for large-scale restoration projects from the reference locations.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
STREAM-3. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors, or re-establish severely degraded or historic riparian corridors, to promote continuity within conservation lands.	California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo	STREAM-4. Plant and/or seed in native riparian vegetation in gaps in existing riparian corridors to promote continuity.
STREAM-4. Replace concrete, earthen or other engineered channels as part of the 10.4 miles of stream restoration to restore floodplain connectivity. Location and length will be determined by site-specific conditions.	California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo	Compliance monitoring and annual reporting. Assess habitat quality of acquired land and prioritize areas for management.
STREAM-5. Replace confined channels to restore floodplain connectivity and commensurate functions as part of the 10.4 miles of stream restoration. Location and length will be determined by site-specific conditions.	California red-legged frog, foothill yellow-legged frog, western pond turtle	Conduct pre- and post-treatment monitoring of community function (performance of ecological processes); habitat composition, structure and pattern; and connectivity as part of a targeted study.
STREAM-6. Manage watershed-wide fine sediment inputs by conditioning controls on runoff from all development projects (see Condition 3) to improve riverine habitat functions and geomorphic processes.	California red-legged frog, foothill yellow-legged frog, western pond turtle, least Bell's vireo	Conduct annual spot checks on new developments to determine whether sediment run-off provisions are consistent with the Conditions outlined in this Plan.
STREAM-7. Implement a brown-headed cowbird control program in coordination with species experts and regulatory agencies that will reduce the impact of brood parasitism on least Bell's vireo nest success, if least Bell's vireos become regular nesters in the study area (>3 nests over at least two consecutive years) and brown-headed cowbird eggs are discovered in vireo nests.	Least Bell's vireo	Compliance monitoring. Monitor for riparian song bird nesting within least Bell's vireo modeled habitat. Periodically, every 5 years, monitor for least Bell's vireo outside of modeled habitat to document range expansion. Quantify the number of occurrences of brood parasitism that are occurring and if/when brown-headed cowbird control program is initiated and efficacy of program.
STREAM-8. Increase the amount of cobblestone substrate suitable to support breeding foothill yellow-legged frogs to 2,000 ft. to areas close to known occurrence(s) of foothill yellow-legged frog or immediately upstream or downstream of known occurrences or other high quality foothill yellow-legged frog breeding habitat.	Foothill yellow-legged frog	Assess yellow-legged frog response to increase in cobblestone substrate as part of a targeted study.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
<b>Wetland and Pond Management (POND)</b>		
POND-1. Install fencing that will reduce grazing pressure and exclude feral pigs on portions of ponds and wetlands and provide vegetated refuge sites for covered species. Fence installation will be carefully applied to avoid negative impacts on small mammal movement and upland habitat.	California tiger salamander, California red-legged frog, western pond turtle	Monitor effectiveness of fencing to exclude livestock and feral pigs and compare vegetation inside of fencing to vegetation outside of fencing. Evaluate success of wetland and pond enhancement using established success criteria.
POND-2. Install woody debris around perimeter and in submerged banks of ponds and wetlands to create basking habitat and cover for native juvenile amphibians and turtles. Materials imported from outside of the watershed shall be treated for chytrid and other potential pathogens prior to installation.	California tiger salamander, California red-legged frog, western pond turtle	Analyze and quantify effectiveness of created basking site through routine monitoring in ponds with known western pond turtle occupancy.
POND-3. Plant native emergent vegetation around the perimeter and in ponds and wetlands.	California tiger salamander, California red-legged frog, western pond turtle	Monitor survivorship of planting, quantify vegetated perimeter of pond, describe habitat quality and periodically survey for species response from covered amphibians and reptiles. Evaluate success of wetland and pond enhancement using established success criteria.
POND-4. Clear vegetation and/or remove sediment in a way that minimizes negative effects on covered species when vegetation and/or sediment restricts the ability of the aquatic environment from meeting the biological goals and objectives of the Plan.	California tiger salamander, California red-legged frog, western pond turtle	Evaluate success of wetland and pond enhancement using established success criteria.
POND-5. If biologically appropriate, graze or mechanically thin around pond perimeter to mimic grazing and promote native species.	California tiger salamander, California red-legged frog, western pond turtle	Evaluate success of wetland and pond enhancement using established success criteria.
POND-6. Restore 20 acres of perennial freshwater marsh within the Reserve System in suitable sites and those likely to support covered species.	California tiger salamander, California red-legged frog, western pond turtle	Compliance monitoring. Monitor freshwater marsh and wetland restoration and assess whether success criteria are being met. Assess connectivity of restored complexes.
POND-7. In addition to the perennial freshwater marsh restoration described in POND-6, restore up to 25 acres of perennial freshwater marsh within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird	Compliance monitoring. Monitor freshwater marsh and wetland restoration and assess whether success criteria are being met. Assess connectivity of restored complexes.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
POND-8. Restore up to 30 acres of seasonal wetlands within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.
POND-9. Create at least 20 acres of ponds at 40 sites, at least 10 sites in the Santa Cruz Mountains and 20 sites in the Diablo Range.	California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird	Compliance monitoring. Monitor pond construction and assess whether success criteria are being met.
POND-10. In addition to the creation of ponds described in POND-9, create up to 52 acres of ponds in-kind within the Reserve System to increase the amount available habitat and enhance connectivity among existing ponds and wetlands if all anticipated impacts occur. <sup>3</sup>	California tiger salamander, California red-legged frog, western pond turtle	Compliance monitoring. Monitor pond construction and assess whether success criteria are being met.
POND-11. Offer financial and regulatory (Safe Harbor Agreement) incentives to private landowners to enhance pond and wetland habitat to suit breeding California red-legged frog, California tiger salamander, and western pond turtle.	California tiger salamander, California red-legged frog, western pond turtle	Compliance monitoring.
POND-12. Educate the public that the use of any salamander species as bait is illegal in the State of California.	California tiger salamander	Compliance monitoring.
POND-13. Excavate sections of ponds to provide deeper pools that will be utilized by California red-legged frog adults and sub-adults and western pond turtles, while maintaining shallow areas to provide rearing habitat for California red-legged frog tadpoles, California tiger salamander larvae, and western pond turtle hatchlings.	California tiger salamander, California red-legged frog, western pond turtle	Monitor use of excavated pond by red-legged frog and western pond turtles as part of a targeted study.
POND-14. Offer financial or regulatory incentives (Safe Harbor Agreement, if listed) to private landowners to enhance pond and marsh habitat to suit breeding tricolored blackbirds, and to ensure that dry-land farming and ranching activities support breeding tricolored blackbirds.	Tricolored blackbird	Compliance Monitoring.
POND-15 Offer financial incentives to private landowners to ensure that dry-land farming and ranching activities support foraging tricolored blackbirds.	Tricolored blackbird	Compliance Monitoring.
POND-16. Restore freshwater marsh, seasonal wetlands, and/or ponds that will support dense reed-like vegetation (cattails) or other native vegetation that will attract nesting tricolored blackbirds.	Tricolored blackbird	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
POND-17. In areas with non-native vegetation (e.g., Himalayan blackberry) that supports existing tricolored blackbird colonies, initiate a gradual (3-4 year) transition from non-native vegetation to native vegetation that is structurally similar.	Tricolored blackbird	Determine areas where tricolored blackbirds are using non-native vegetation and ensure that there is a management plan in place to control the spread of the non-native vegetation and transition the colony to native vegetation if necessary.
POND-18. (not used)		
POND-19. Restore a minimum of 20 acres and up to 45 acres of freshwater marsh within the Reserve System in the Santa Cruz Mountains, Santa Clara Valley, and Diablo Range.	Tricolored blackbird	Compliance monitoring. Monitor habitat restoration and assess whether success criteria are being met. Monitor use of restored habitat by tricolored blackbird.
<b>Directed Studies</b>		
STUDIES-1. Conduct feasibility study to determine wildlife movement across Coyote Creek downstream of Anderson Reservoir, Pacheco Creek (SR 152), and the Pajaro River.	Covered wildlife species	Analyze and quantify movement of indicator species to determine whether linkages are functioning as intended.
STUDIES-2. Determine factors relevant to the health and regeneration of native chaparral/scrub species. Targeted studies will be initiated within first 10 years of plan implementation. Use results of targeted studies to revise and improve management actions.	California tiger salamander, California red-legged frog, western pond turtle, western burrowing owl	Conduct targeted research that identifies key factors affecting regeneration and succession of chaparral/scrub.
STUDIES-3. Experimentally manage oak woodlands to reduce seedling mortality, increase seedling and sapling survival and determine factors relevant to regeneration, including browsing by mammals, birds, and insects.	California tiger salamander, California red-legged frog, western pond turtle, San Joaquin kit fox	Conduct targeted research that identifies key factors affecting seedling mortality, seedling and sapling survival and factors relevant to oak woodland regeneration.
STUDIES-4. Experimentally manage redwood forest to determine factors relevant to regeneration and maintenance; possibly including prescribed burning, selective thinning, and other management actions to meet this objective.	California red-legged frog, foothill yellow-legged frog, western pond turtle	Conduct targeted research in redwood forest, ponderosa pine woodland, and knobcone pine woodland to guide management actions and other factors relevant to regeneration and maintenance.
STUDIES-5. Conduct targeted studies to determine factors limiting the expansion of the covered plant species, including but not limited to its management and micro-site needs, and implement measures to mitigate or eliminate these factors to promote occurrence expansion.	Coyote ceanothus, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, most beautiful jewelflower, Mount Hamilton thistle, smooth lessingia, fragrant fritillary, Tiburon Indian paintbrush, Loma Prieta hoita	Monitor results of research and the effects of its application.



Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
STUDIES-6. Conduct a directed study to census egg masses in breeding habitat downstream of reservoirs before and after releases to determine whether eggs masses were lost.	Foothill yellow-legged frog	Monitor effects of pulse flows on foothill yellow-legged frog.
STUDIES-7. In the case of ponds, wetlands, and/ or amphibian populations becoming infected with chytrid fungus or other diseases, use the best scientific information available to manage and stop spread of epidemic.	California tiger salamander, California red-legged frog, western pond turtle, foothill yellow-legged frog	Monitor for the presence of disease. Monitor efficacy of disease control actions.
STUDIES-8. Identify the distribution and risk to existing indigenous populations of covered amphibians and reptiles from hybridization (e.g., California tiger salamander hybridizing with Texas salamander) within the Reserve System. Appendix K, California Tiger Salamander Hybridization, will serve as the Management Plan for CTS hybridization issues and will be updated throughout the permit term for adaptive management	California tiger salamander	Monitor for the presence of non-natives and hybrids. Test and document efficacy of management plan.
STUDIES-9. Annually identify and maintain upland breeding sites (even if sites are not “natural”) for western pond turtle because of the high fidelity of use from year to year .	Western pond turtle	Monitor use of protected sites to determine factors influencing nest success in areas of known turtle use.
STUDIES-10. (not used)		
STUDIES-11. Conduct experimental burning in protected occurrences of targeted covered plant species to determine the importance of fire for plant regeneration.	California tiger salamander, western burrowing owl, San Joaquin kit fox, Coyote ceanothus	Monitor effects of burns on covered species
STUDIES-12. Ensure seeds from natural occurrences in the Study Area are stored and maintained at a minimum of one Center for Plant Conservation certified botanic garden.	Coyote ceanothus, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, most beautiful jewelflower, Mount Hamilton thistle, smooth lessingia,	Monitor viability of seed collection and refresh collection, as necessary.

Table 5-2b. Continued

Management Action	Target Species	Monitoring Action
STUDIES-13. Identify suitable locations for and establish target number of new covered plant occurrences in the Reserve System.	Coyote ceanothus, Metcalf Canyon jewelflower	Compliance monitoring and annual reports.
STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	Coyote ceanothus, Metcalf Canyon jewelflower	Monitor newly established and source occurrences.
STUDIES-13. Identify suitable locations for and establish target number of new covered plant occurrences in the Reserve System.	Coyote ceanothus, Metcalf Canyon jewelflower	Monitor the results of all experiments.
STUDIES-14. Determine suitable propagation or planting techniques for targeted covered plant species and determine biologically appropriate seed sampling techniques from existing occurrences.	Coyote ceanothus, Metcalf Canyon jewelflower	Monitor newly established and source occurrences.
STUDIES-15. Design and implement field experiments (if the number of propagules will not be significantly impacted) to test alternative techniques for establishment of targeted covered plant occurrences. Field experiments will be continue until target number of occurrences are established.	Coyote ceanothus, Metcalf Canyon jewelflower	Monitor the results of all experiments.
STUDIES-16. Monitor the effects of livestock grazing (or predation by other species, e.g., black-tailed jackrabbit) on targeted covered plant species by conducting exclusion experiments and monitoring effects on occurrences, including control sites in the monitoring plan.	Santa Clara Valley dudleya, Mount Hamilton Thistle, smooth lessingia, Tiburon Indian paintbrush, fragrant fritillary	Monitor the effects of grazing on management on covered plant species.
STUDIES-17. Monitor Metcalf Canyon jewelflower and most beautiful jewelflower introgression and develop protocols to protect the genetic integrity of both species.	Metcalf Canyon jewelflower, most beautiful jewelflower,	Monitor the results of research and success of developed protocols.

**Table 5-3.** Guidelines Used to Set Quantitative Objectives for Species Habitat Protection in the Absence of Species-Specific Data

Proportion of Species' Current Range in the Study Area	General Range of Conservation Obligation of Plan <sup>1,2</sup>	Example Covered Species
96–100%	80–100%	Bay checkerspot butterfly, Coyote ceanothus, Santa Clara Valley dudleya, smooth lessingia, Metcalf Canyon jewelflower, most beautiful jewelflower
66–95%	65–90%	Mount Hamilton thistle
36–65%	40–75%	Loma Prieta hoita
11–35%	20–50%	California tiger salamander
1–10%	10–35%	California red-legged frog, foothill yellow-legged frog, least Bell's vireo
<1%	5–20%	San Joaquin kit fox, tricolored blackbird, Western burrowing owl, Western pond turtle

Notes:

1: Values expressed as a percentage of the available habitat in the study area and used as guidelines only in the absence of species-specific data. Actual conservation obligations were determined based on a variety of biological, economic, land use, and regulatory factors; see text for more explanation. Quantitative objectives were set using land cover types rather than species habitat.

2: Quantitative biological objectives were developed at the lower or higher end of these ranges based on a series of additional factors, or “modifiers.”

A conservation obligation was set at the higher end of the guideline (or beyond it) if one or more of the following factors applied:

- species' historic range was much greater than current range (i.e., a substantial range contraction has occurred);
- species is highly sensitive to management or human disturbance, or management needs are uncertain;
- species population sizes are relatively low or unknown;
- threats to species are severe or widespread;
- impacts from covered activities affect a relatively high proportion of species occurrences or potential habitat.

A conservation obligation was set near the low end of the scale if one or more of the following factors applied:

- species' habitat is abundant in the study area;
- there are a relatively large number of extant occurrences in the study area;
- the proportion of the species' range in the study is at the low end of the scale.

**Table 5-4.** Gap Analysis for Land Cover Types (acres)

Land Cover Type	Total in Study Area	Open Space Classification (acres, unless otherwise noted)						% of Total in StudyArea	
		Type 1	Type 2	Type 3	Type 4	Total Type 1, 2, 3	Total Open Space	Type 1	Type 1, 2, 3
California Annual Grassland	81,795	8,538	2,290	9,988	568	20,816	21,383	10%	25%
Serpentine Bunchgrass Grassland	10,308	1,262	183	2,160	407	3,605	4,012	12%	35%
Serpentine Rock Outcrop / Barrens	260	6	2	48	2	56	58	2%	22%
Serpentine Seep	34	1	0	12	4	13	16	2%	37%
Rock Outcrop	87	10	0	2	8	12	20	12%	14%
Northern Mixed Chaparral / Chamise Chaparral	23,763	3,766	1,525	475	37	5,766	5,804	16%	24%
Mixed Serpentine Chaparral	3,712	221	356	791	67	1,369	1,436	6%	37%
Northern Coastal Scrub / Diablan Sage Scrub	10,306	574	1,083	1,260	102	2,918	3,019	6%	28%
Coyote Brush Scrub	180	10	0	47	6	56	63	5%	31%
Valley Oak Woodland	12,895	3,460	249	1,320	19	5,029	5,048	27%	39%
Mixed Oak Woodland and Forest	84,488	16,522	5,463	11,934	485	33,920	34,405	20%	40%
Blue Oak Woodland	11,160	4,263	124	946	33	5,333	5,366	38%	48%
Coast Live Oak Forest and Woodland	31,652	3,155	1,454	3,826	265	8,434	8,700	10%	27%
Foothill Pine - Oak Woodland	10,960	3,053	578	505	2	4,136	4,138	28%	38%
Mixed Evergreen Forest	5,775	14	767	1,025	0	1,806	1,806	0%	31%
Willow Riparian Forest and Scrub	2,544	23	204	805	311	1,032	1,343	1%	41%
Central California Sycamore Alluvial Woodland	373	0	111	56	0	167	168	0%	45%
Mixed Riparian Forest and Woodland	3,766	183	61	591	263	834	1,097	5%	22%
Redwood Forest	9,693	4	138	3,006	0	3,148	3,148	0%	32%
Ponderosa Pine Woodland	419	411	1	1	0	414	414	98%	99%
Knobcone Pine Forest	711	0	50	87	0	137	137	0%	19%
Coastal and Valley Freshwater Marsh	381	24	42	140	11	206	217	6%	54%
Seasonal Wetland	201	37	3	55	5	95	100	18%	47%
Pond	1,110	65	28	316	169	410	579	6%	37%
Reservoir	2,767	0	78	2,337	49	2,415	2,465	0%	87%
Streams (miles; not included in totals)	2,392	376	134	293	51	803	854.3	16%	34%

Table 5-4. Continued

Land Cover Type	Total in Study Area	Open Space Classification (acres, unless otherwise noted)						% of Total in StudyArea	
		Type 1	Type 2	Type 3	Type 4	Total Type 1, 2, 3	Total Open Space	Type 1	Type 1, 2, 3
<b>Subtotal All Natural or Water Land Cover Types</b>	<b>309,338</b>	<b>45,604</b>	<b>14,790</b>	<b>41,732</b>	<b>2,816</b>	<b>102,126</b>	<b>104,942</b>		
Orchard	2,697	3	0	91	99	94	193	0%	3%
Vineyard	1,393	1	8	0	95	9	104	0%	1%
Grain, Row-crop, Hay & Pasture, Disked/short-te	33,648	873	381	923	2,371	2,177	4,548	3%	6%
Agriculture developed / Covered Ag	1,935	11	0	2	10	13	24	1%	1%
<b>Subtotal All Agricultural Land Cover Types</b>	<b>39,673</b>	<b>887</b>	<b>389</b>	<b>1,016</b>	<b>2,576</b>	<b>2,293</b>	<b>4,869</b>		
Urban - Suburban	89,438	67	243	742	1,271	1,052	2,323		
Rural - Residential	12,414	9	16	231	157	256	414		
Golf Courses / Urban Parks	8,673	10	13	1,322	3,763	1,345	5,108		
Ornamental Woodland	95	0	0	0	11	0	11		
Landfill	364	0	0	0	0	0	0		
Barren	211	0	0	19	0	19	19		
<b>Subtotal All Development Land Cover Types</b>	<b>111,194</b>	<b>85</b>	<b>272</b>	<b>2,315</b>	<b>5,203</b>	<b>2,672</b>	<b>7,875</b>		
<b>Grand Total</b>	<b>460,205</b>	<b>46,577</b>	<b>15,451</b>	<b>45,063</b>	<b>10,595</b>	<b>107,091</b>	<b>117,686</b>		

**Table 5-5.** Existing Open Space and Interim Conservation Lands Proposed for the Reserve System and Specific Conservation Actions within Each Site

Ownership	Area in Study Area (acres)	Proposed for Reserve System <sup>1</sup> (acres)	Existing Resources that Contribute Substantially to Biological Goals and Objectives of Habitat Plan	Conservation Actions Proposed
Existing Open Space				
<i>County Parks</i>				
Almaden Quicksilver County Park	4,138	653	<ul style="list-style-type: none"> <li>• Extensive stands of mixed oak woodland (2,100 acres) and over 200 acres of blue oak woodland</li> <li>• Over 300 acres of mixed evergreen forest</li> <li>• Provides habitat connectivity within the Santa Cruz Mountains and to extensive protected open space outside of study area</li> <li>• Important populations of covered plants including most beautiful jewelflower, Santa Clara Valley dudleya, and Loma Prieta hoita.</li> <li>• Suitable habitat present for fragrant fritillary and smooth lessingia.</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance serpentine grassland and chaparral</li> <li>• Improved management of covered plant populations</li> </ul>
Anderson Lake County Park	3,144	486	<ul style="list-style-type: none"> <li>• Small stands of serpentine grassland (33 acres) and serpentine chaparral (37 acres) as well as coast live oak and mixed oak woodland and forest</li> <li>• Provides watershed protection for Anderson Reservoir and subsequently Coyote Creek</li> <li>• Provides important wildlife linkage between Coyote Creek, Coyote Ridge and Henry W. Coe State Park</li> <li>• Two of four populations of Coyote ceanothus (all of one, a portion of another)</li> <li>• Populations of Mt. Hamilton thistle, Santa Clara dudleya, and smooth lessingia</li> </ul>	<ul style="list-style-type: none"> <li>• Protect and enhance two populations of Coyote ceanothus, including a portion of the largest known population</li> <li>• Protect and enhance smooth lessingia populations</li> <li>• Enhance serpentine chaparral</li> <li>• Protect and enhance of Mt. Hamilton population</li> <li>• Protect and enhance Santa Clara dudleya population</li> </ul>

Table 5-5. Continued

Ownership	Area in Study Area (acres)	Proposed for Reserve System <sup>1</sup> (acres)	Existing Resources that Contribute Substantially to Biological Goals and Objectives of Habitat Plan	Conservation Actions Proposed
Calero County Park	4,455	1,690	<ul style="list-style-type: none"> <li>• Extensive stands of mixed oak woodland (1,562 acres) and over 620 acres of California annual grassland</li> <li>• 268 acres of serpentine grassland, much of which may be suitable for Bay checkerspot butterfly</li> <li>• Provides important habitat connectivity within the Santa Cruz Mountains</li> <li>• California tiger salamander and Bay checkerspot butterfly critical habitat</li> <li>• Populations of most beautiful jewelflower, Santa Clara Valley dudleya, Loma Prieta hoita, smooth lessingia and fragrant fritillary</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance breeding habitat for California tiger salamander and Western pond turtle in 3 ponds</li> <li>• Stream enhancement in upper Llagas Creek and tributaries to benefit known population of foothill yellow-legged frog</li> <li>• Enhancement of potential Bay checkerspot butterfly habitat</li> <li>• Enhance covered serpentine plant populations: Santa Clara Valley dudleya, most beautiful jewelflower, Loma Prieta hoita, and fragrant fritillary</li> <li>• Protect key landscape linkage between Diablo Range and Santa Cruz Mountains</li> </ul>
Coyote Lake-Harvey Bear Ranch County Park	4,595	825	<ul style="list-style-type: none"> <li>• Over 2,400 acres of California annual grassland and extensive stands of oak woodland and willow riparian forest and scrub (154 acres)</li> <li>• Provides watershed protection for Coyote Reservoir and subsequently Coyote Creek</li> <li>• California tiger salamander critical habitat</li> <li>• Bay checkerspot butterfly habitat occupied in recent past</li> <li>• Extensive ponds and aquatic habitat for covered amphibians and reptiles</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance serpentine grassland to create potential satellite population of Bay checkerspot butterfly</li> <li>• Improve breeding habitat for California tiger salamander</li> </ul>
Joseph D. Grant County Park	9,560	7,760	<ul style="list-style-type: none"> <li>• Over 5,000 acres of mixed oak woodland, 920 acres of valley oak woodland, and 350 acres of blue oak woodland</li> <li>• Extensive annual grassland (2,800 acres)</li> <li>• Core protected area between Henry W. Coe State Park to the south and protected lands both inside and outside of the study area to the north</li> <li>• California tiger salamander and California red-legged frog critical habitat and likely provides important regional connectivity for both species</li> <li>• Many ponds and other aquatic habitat for red-legged frog, tiger salamander, pond turtle</li> <li>• Stream habitat for foothill yellow-legged frog</li> <li>• Important stands of riparian woodland</li> <li>• 20% of seasonal wetland in study area (40 acres)</li> </ul>	<ul style="list-style-type: none"> <li>• Restoration and enhancement of valley oak woodland</li> <li>• Increase breeding and upland habitat quality for both California red-legged frog and California tiger salamander</li> <li>• Riparian restoration and enhancement along San Felipe Creek and tributaries that will improve habitat for foothill yellow-legged frog</li> <li>• Freshwater marsh restoration, possibly to support tricolored blackbird</li> </ul>

Table 5-5. Continued

Ownership	Area in Study Area (acres)	Proposed for Reserve System <sup>1</sup> (acres)	Existing Resources that Contribute Substantially to Biological Goals and Objectives of Habitat Plan	Conservation Actions Proposed
Santa Teresa County Park	1,646	877	<ul style="list-style-type: none"> <li>• Over 670 acres of serpentine bunchgrass grassland, 164 acres of mixed oak woodland, and 179 acres of coast live oak woodland</li> <li>• Extensive potential habitat Bay checkerspot butterfly; core site on west side of Valley</li> <li>• Large populations of most beautiful jewelflower, Santa Clara Valley dudleya, Loma Prieta hoita, smooth lessingia, and Mount Hamilton thistle</li> <li>• Provides habitat connectivity on the west side of the narrowest point in the valley and likely is important for wildlife movement</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance serpentine bunchgrass grassland through livestock grazing</li> <li>• Best opportunity to create large amount of Bay checkerspot butterfly habitat</li> <li>• Enhance serpentine covered plant populations</li> </ul>
<i>Open Space Authority<sup>2</sup></i>				
Palasou Ridge	782	TBD	<ul style="list-style-type: none"> <li>• 310 acres of mixed oak woodland and forest, 114 acres of coast live oak forest and woodland, 89 acres of mixed evergreen forest, 61 acres of sycamore alluvial woodland, 26 acres of foothill pine-oak woodland, 23 mixed serpentine chaparral, foothill pine-oak woodland, and willow riparian forest and scrub</li> <li>• 782 acres of California red-legged frog critical habitat (STC-1B)</li> <li>• One occurrence of smooth lessingia</li> <li>• Includes modeled habitat for foothill yellow-legged frog, western pond turtle, California red-legged frog, California tiger salamander, western pond turtle, and golden eagle</li> <li>• 1.5 stream miles of upper Coyote Creek (above Coyote Reservoir)</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat enhancement along upper Coyote Creek for least Bell's vireo</li> <li>• Maintain and enhance sycamore alluvial woodland</li> <li>• Enhance pond habitat for California tiger salamander and California red-legged frogs; control bullfrog populations</li> </ul>



Table 5-5. Continued

Ownership	Area in Study Area (acres)	Proposed for Reserve System <sup>1</sup> (acres)	Existing Resources that Contribute Substantially to Biological Goals and Objectives of Habitat Plan	Conservation Actions Proposed
Sierra Vista	984	TBD	<ul style="list-style-type: none"> <li>• 388 acres of mixed oak woodland and forest, 109 acres coast live oak forest, 95 acres northern coastal scrub/Diablan sage scrub, 38 acres northern mixed chaparral/chamise chaparral, 2.4 acres of ponds, and 0.8 acres of willow riparian and scrub</li> <li>• 984 acres of California red-legged frog critical habitat (STC-1A)</li> <li>• Bordered completely on the east by proposed Reserve System lands</li> <li>• Includes modeled habitat for California red-legged frog, foothill yellow-legged frog, California tiger salamander, western pond turtle, and golden eagle.</li> <li>• 2.2 stream miles of upper Penitencia Creek and tributaries</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance pond habitat for California tiger salamander and California red-legged frogs; control bullfrog populations</li> <li>• Enhance willow riparian habitat for least Bell's vireo and tri-colored blackbird</li> <li>• If needed, enhance stream habitat for foothill yellow-legged frog</li> </ul>
Rancho Cañada del Oro	626	TBD	<ul style="list-style-type: none"> <li>• 401 acres of mixed evergreen forest, 99 acres of northern mixed chaparral/chamise chaparral, 70 acres of mixed oak woodland and forest, 53 acres of redwood forest, and 1.6 acres of knobcone pine woodland</li> <li>• Includes modeled habitat for foothill yellow-legged frog, California red-legged frog, western pond turtle, and golden eagle</li> <li>• Proposed Reserve System lands abut property to the west and to the south</li> <li>• 1.3 stream miles of upper Uvas-Carnadero Creek (above Calero Reservoir) that has suitable habitat for foothill yellow-legged frog</li> </ul>	<ul style="list-style-type: none"> <li>• Fire management for knobcone pine</li> <li>• If needed, enhance stream habitat for foothill yellow-legged frog</li> </ul>
County Parks subtotal	27,538	12,291		
Open Space Authority subtotal	2,392	1,000		
Total Existing Open Space	29,930	13,291 <sup>3</sup>		

Table 5-5. Continued

Ownership	Area in Study Area (acres)	Proposed for Reserve System <sup>1</sup> (acres)	Existing Resources that Contribute Substantially to Biological Goals and Objectives of Habitat Plan	Conservation Actions Proposed
Interim Conservation Lands <sup>4</sup>				
<i>County Parks</i>				
Tulare Hill (October 2009)	141	134	• Habitat for Bay checkerspot butterfly, known locations of smooth lessingia and Santa Clara Valley dudleya, reintroduction site for Metcalf Canyon jewelflower, critical corridor connecting Diablo Range with Santa Cruz Mountains (Linkage 8).	• Conservation Analysis Zone Guadalupe-3
Rancho San Vicente (October 2009)	966	966	• Extensive serpentine grassland, serpentine chaparral, blue oak woodland, valley oak woodland, and riparian woodland; supports known populations of at least four covered species: Santa Clara Valley dudleya, most beautiful jewelflower, smooth lessingia, and Mt. Hamilton thistle; supports habitat for at least five covered species: Bay checkerspot butterfly, California red-legged frog (upland), California tiger salamander (upland), and Western burrowing owl (foraging); completes landscape linkage between Almaden Quicksilver County Park and complex of open space surrounding Calero Lake (Linkage 9).	• Conservation Analysis Zone Guadalupe-1
Total Interim Lands	1,107	1,100		

## Notes:

<sup>1</sup> Estimated amount to be added to the Reserve System based on air photo and land cover map analysis. Final acreage may differ (but will not exceed 13,291 acres). See Section 5.2.3, subheading *Existing Open Space in the Reserve System* and Section 9.4.2, subheading *Santa Clara County Open Space Authority* for a detailed discussion regarding incorporation of existing open space into the Reserve System.

<sup>2</sup> As described in Section 9.4.2 subheading *Santa Clara County Open Space Authority*, the Open Space Authority intends to enroll up to 1,000 acres of its existing lands into the Reserve System. These 1,000 acres may come from any of the Open Space Authority land identified.

<sup>3</sup> This is the maximum acreage of existing open space that would be credited toward the Reserve System size under the Plan. Additional acres of existing open space could be incorporated into the Reserve System; however, they would not receive credit toward the Reserve System size. Alternatively, the Implementing Entity may acquire new lands for the Reserve System in place of adding this acreage from existing open space, as long as the total Reserve System size requirements are met.

<sup>4</sup> Following the issuance of permits, lands acquired during Plan preparation may count toward permit obligations once the partner agency completes its recreation plans and the Wildlife Agencies approve of their incorporation into the Reserve System. Rancho San Vicente and Tulare Hill (acquired October 2009 using County Park Charter Fund) are considered interim conservation and could be incorporated into the Reserve System after recreation plans have been completed for those lands.

**Table 5-6.** Gap Analysis for Covered Species with Habitat Distribution Models (acres)

Species and Habitat Type	Total Modeled Habitat in Study Area	Open Space Classification (acres, unless otherwise noted)						% of Total Modeled Habitat in Study Area	
		Type 1	Type 2	Type 3	Type 4	Total Type 1, 2, 3	Total Open Space	Type 1	Type 1, 2, 3
<b>Bay Checkerspot Butterfly</b>									
Primary Habitat	8,621	1,336	34	1,550	384	2,921	3,304	15%	34%
<b>California Tiger Salamander</b>									
Breeding Habitat	1,027	100	32	271	29	403	432	10%	39%
Non-breeding Habitat	323,721	45,667	13,770	37,583	4,567	97,020	101,587	14%	30%
Total	324,748	45,767	13,802	37,853	4,596	97,423	102,019	14%	30%
<b>California Red-Legged Frog</b>									
Primary Habitat	10,101	730	576	1,924	633	3,230	3,863	7%	32%
Secondary Habitat	331,672	45,523	14,479	37,932	4,203	97,934	102,137		
Total	341,773	46,253	15,055	39,856	4,836	101,164	106,000	14%	30%
<b>Foothill Yellow-Legged Frog (length in miles)</b>									
Primary Habitat	244	37	9	24	7	70	77	15%	29%
Secondary Habitat	447	82	18	52	6	152	158	18%	34%
Total	690	119	28	76	13	222	235	17%	32%
<b>Western Pond Turtle</b>									
Primary Habitat	82,895	13,900	4,566	10,102	1,233	28,568	29,802	17%	34%
Secondary Habitat	232,021	31,067	10,346	28,078	3,048	69,491	72,539	13%	30%
Total	314,916	44,967	14,912	38,180	4,281	98,060	102,341	14%	31%
<b>Western Burrowing Owl<sup>1</sup></b>									
Overwintering Habitat	132,770	12,584	2,710	13,224	3,507	28,517	32,024	9%	21%
Occupied Nesting Habitat	1,348	0	179	26	287	204	491	0%	15%
Potential Nesting Habitat	63,751	1,003	904	7,174	6,353	9,080	15,433	2%	14%
Total	197,869	13,586	3,792	20,423	10,146	37,802	47,948	7%	19%
<b>Tricolored Blackbird</b>									
Primary Habitat	7,933	295	440	1,811	676	2,546	3,222	4%	32%
Secondary Habitat	132,358	10,742	2,867	13,280	3,570	26,888	30,459	8%	20%
Total	140,291	11,037	3,307	15,091	4,246	29,435	33,681	8%	21%

Table 5-6. Continued

Species and Habitat Type	Total Modeled Habitat in Study Area	Open Space Classification (acres, unless otherwise noted)						% of Total Modeled Habitat in Study Area	
		Type 1	Type 2	Type 3	Type 4	Total Type 1, 2, 3	Total Open Space	Type 1	Type 1, 2, 3
<b>Least Bell's Vireo</b>									
Primary Habitat	3,097	65	62	203	179	330	509	2%	11%
<b>San Joaquin Kit Fox</b>									
Secondary Habitat	38,543	5,067	293	652	1	6,012	6,013	13%	16%
Secondary Habitat (Low Use)	2,349	0	303	0	11	303	314	0%	13%
Total	40,892	5,067	596	652	11	6,315	6,326	12%	15%
<b>Mt. Hamilton Thistle</b>									
Primary Habitat	487	55	6	144	10	204	214	11%	42%
<b>Fragrant Fritillary</b>									
Primary Habitat	8,820	1,025	122	1,927	305	3,074	3,379	12%	35%
Secondary Habitat	156,635	15,346	6,931	16,967	957	39,243	40,201	10%	25%
Total	165,455	16,371	7,053	18,894	1,263	42,317	43,580	10%	26%
<b>Loma Prieta Hoita</b>									
Primary Habitat	104,126	15,133	6,405	12,888	734	34,426	35,160	15%	33%
Secondary Habitat	17,745	2,143	924	1,174	104	4,241	4,345	12%	24%
Total	121,871	17,276	7,328	14,063	839	38,667	39,506	14%	32%
<b>Smooth Lessingia</b>									
Primary Habitat	10,491	1,268	185	2,207	410	3,659	4,069	12%	35%
<b>Metcalf Canyon Jewelflower</b>									
Primary Habitat	8,105	984	48	1,811	306	2,843	3,149	12%	35%
<b>Most Beautiful Jewelflower</b>									
Primary Habitat	14,277	1,490	541	2,999	477	5,030	5,506	10%	35%
Secondary Habitat	85	10	0	2	8	12	20	12%	14%
Total	14,362	1,500	541	3,000	485	5,042	5,527	10%	35%

<sup>1</sup> Western burrowing owl modeled habitat includes occupied and potential nesting habitat only in the study area.

**Table 5-7.** Gap Analysis of Bay Checkerspot Butterfly Populations (acres)

Bay Checkerspot Butterfly Habitat		Core or Satellite Habitat Unit <sup>3</sup>	Conservation Target for Habitat Plan <sup>4</sup>	Site Name in USFWS Recovery Plan (1998)	Total Habitat unit (acres)	Open Space (OS) (acres)				Total Type 1, 2,3	Total in OS (acres)	% of Total Habitat unit in		Total Outside OS (acres)
						Type 1	Type 2	Type 3	Type 4			Type 1	Type 1, 2, 3	
Units <sup>1</sup>	Habitat unit Status <sup>2</sup>	Unit <sup>3</sup>	Habitat Plan <sup>4</sup>	Plan (1998)	(acres)	Type 1	Type 2	Type 3	Type 4	1, 2,3	(acres)	Type 1	Type 1, 2, 3	(acres)
UTC	Occupied	Core	Yes	Kirby	1,607	96		16	134	112	246	6%	7%	1,361
Kirby/East Hills	Occupied	Core	Yes	Kirby	1,334	588	8	43	2	640	641	44%	48%	693
Pigeon Point	Occupied	Core	Yes	Kirby	117			11		11	11	0%	10%	106
Silver Creek Hills Central	Occupied	Core	Yes	Silver Creek	208					0	0	0%	0%	208
Metcalf North Ridge	Occupied	Core	Yes	San Felipe	518			0		0	0	0%	0%	518
Metcalf	Occupied	Core	Yes	Metcalf	629	3			0	3	3	0%	0%	626
Hale/Falcon Crest	Occupied	Satellite	Yes	W Hills of Santa Clara Valley	371	4				4	4	1%	1%	366
Cañada Garcia	Occupied	Satellite	Yes	W Hills of Santa Clara Valley	180	23	19			42	42	13%	23%	137
Kalana Avenues (1-4)	Occupied	Satellite	Yes	W Hills of Santa Clara Valley	110			2		2	2	0%	2%	109
Tulare Hill	Occupied	Satellite	Yes	Tulare Hill	336	144		125	0	269	269	43%	80%	67
Santa Teresa Main	Occupied	Satellite	Yes	Santa Teresa Hills	936			464	169	464	633	0%	50%	303
Santa Teresa North	Potential (no records)	Satellite	Yes	Santa Teresa Hills	190			186	0	186	186	0%	98%	4
Coyote-Bear Ranch County Park	Occupied	Satellite	Yes	None	60			60		60	60	0%	100%	0
Calero	Occupied	Satellite	Yes	Calero	359			352		352	352	0%	98%	7
Subtotal: Target Areas					6,955	858	28	1,260	305	2,146	2,450	12%	31%	4,505
Silver Creek Hills North #1	Occupied	Core	No	Silver Creek	382	345			5	345	350	90%	90%	32
Silver Creek Hills North #2	Potential (no records)	Core	No	Silver Creek	406	103		27	27	130	156	25%	32%	249
Pound Site	Occupied	Core	No <sup>5</sup>	Metcalf	216			216		216	216	0%	100%	0
Communications Hill 1	Historic/Unoccupied	Satellite	No	Communications Hill	230				2	0	2	0%	0%	229
Communications Hill 2	Historic/Unoccupied	Satellite	No	Communications Hill	25				4	0	4	0%	0%	21
San Martin/Hayes Valley	Occupancy Unknown <sup>6</sup>	Satellite	No	W Hills of Santa Clara Valley?	201	29			0	29	29	14%	14%	172
Southwest Anderson Reservoir	Occupancy Unknown	Satellite	No <sup>7</sup>	North of Llagas Ave.	189		7	48	36	55	90	0%	29%	99
Valley Christian High School	Historic/Unoccupied	Satellite	No	None	15				6	0	6	0%	0%	9
Subtotal: Non-Target Areas					1,665	477	7	291	79	775	854	29%	47%	811
<b>Grand Total</b>					<b>8,621</b>	<b>1,336</b>	<b>34</b>	<b>1,551</b>	<b>384</b>	<b>2,921</b>	<b>3,304</b>	<b>15%</b>	<b>34%</b>	<b>5,316</b>

Notes:

<sup>1</sup> See species account in Appendix D for key to habitat units and map of their locations. Habitat Unit names are derived from the long-term monitoring conducted by Stanford University.

<sup>2</sup> Occupied = known to be occupied at least in some years; Occupancy Unknown = site has not been surveyed thoroughly or surveyed in last 10 years;

Historic/Unoccupied = individuals present historically but now unoccupied and site likely no longer suitable; Potential (no records) = Site contains habitat that could be made suitable with proper management (currently unoccupied).

<sup>3</sup> Core habitat units are defined as moderate to large areas of suitable habitat that support persistent populations of the species. Satellite habitat units are defined as smaller areas of lower-quality habitat that are not consistently occupied and rely on recolonization from core habitat units to be sustained (U.S. Fish and Wildlife Service 1998).

<sup>4</sup> Habitat units targeted for conservation were determined through consultations with experts through the biological goals and objectives workshop and were based on factors such as population size, distance from Coyote Ridge, land ownership patterns, and overall long-term population viability.

<sup>5</sup> The majority of this habitat unit is not suitable habitat and is not targeted for conservation. However, portions of this site that support suitable habitat may be targeted for conservation to support connectivity to the Tulare Hill habitat unit.

<sup>6</sup> Population documented in late 1980s but no recent surveys.

<sup>7</sup> A small portion (less than 1 acre) of this habitat unit is expected to be added to the Reserve System from existing open space for Coyote ceanothus conservation. It is not considered a conservation target for Bay checkerspot butterfly.

**Table 5-8.** Gaps in Conservation Identified by San Francisco Bay Area Gap Analysis Project for Land Cover Types in the Habitat Plan Study Area<sup>1</sup>

Vegetation Community (Holland 1986)	Equivalent Land Cover Type in Habitat Plan (see Table 3-2)	Protection Estimated in Bay Area (Wild 2002)	Protection Estimated in California (Wild 2002)
Non-native grassland	Annual grassland	18%	5%
Northern mixed chaparral	Northern mixed chaparral / chamise chaparral	1%	8%
Mixed serpentine chaparral	Mixed serpentine chaparral	0%	1%
Diablan sage scrub	Northern coastal scrub/ Diablan sage scrub	12%	2%
Valley oak woodland	Valley oak woodland	18%	1%
Blue oak woodland	Blue oak woodland	19%	4%
Coast live oak woodland <sup>2</sup>	Coast live oak forest and woodland	20%	4%
Coast live oak forest <sup>2</sup>	Coast live oak forest and woodland	12%	5%
Foothill pine-oak woodland	Foothill pine-oak woodland	18%	3%
Great Valley cottonwood riparian forest	Mixed riparian forest and woodland	0% <sup>3</sup>	19%
North coast riparian scrub	Willow riparian woodland and scrub	0%	4%
Coast range ponderosa pine forest	Ponderosa pine forest	13%	23%
Coastal and valley freshwater marsh	Coastal and valley freshwater marsh	21%	38%

Notes:

<sup>1</sup> Vegetation communities are those in Wild (2002) with less than 20% protection for most types or less than 100% protection for those communities with a range-wide historic decline of more than 80%.

<sup>2</sup> These vegetation communities were also identified as having >25% of the state's extent within the San Francisco Bay Area (i.e., high endemism).

<sup>3</sup> Due to large minimum mapping unit, actual protection is likely higher.

**Table 5-9.** Landscape Linkages in and Near the Study Area Considered for the Reserve Design

Ref. # (Fig. 5-6)	Linkage (Listed Generally from North to South)	Approx. Length <sup>1</sup> (miles)	General Linkage Purpose	Covered and Other Native Species Likely to Use Linkage <sup>2</sup>	Sources
1	Guadalupe River and Guadalupe Creek	33	Connection between San Francisco Bay/Pacific Ocean and spawning habitat for native resident and anadromous fish. Provides regional linkage for riparian birds into the study area. Upper watershed provides local linkages for many wildlife species.	Steelhead trout, Chinook salmon, Pacific lamprey, and Sacramento sucker.	Leidy et al. 2005; FAHCE 2000
2	Coyote Creek from San Francisco Bay to Anderson Dam	32	Connection between San Francisco Bay/Pacific Ocean and spawning habitat for native resident and anadromous fish. Provides regional linkage for riparian birds into the study area. Also provides linkages for native amphibians and aquatic reptiles between off-stream breedings sites in Diablo Range and Santa Cruz Mountains.	Steelhead trout, Chinook salmon, Pacific lamprey, Sacramento sucker, California red-legged frog, Western pond turtle, foothill yellow-legged frog (?)	Leidy et al. 2005; FAHCE 2000; County of Santa Clara Parks & Recreation Department 2007; EDAW 2001; California Wilderness Coalition 2002
3	Upper Penitencia Creek	11.5	Connection between San Francisco Bay/Pacific Ocean and spawning habitat for native resident and anadromous fish.	Steelhead trout, Pacific lamprey, Sacramento sucker.	Leidy et al. 2005; Stillwater Sciences 2006; Biotic Resource Group 2001
4	Joseph D. Grant County Park to SFPUC Alameda Watershed (outside study area)	3	Provide linkage between protected lands in northeast corner of study area and protected lands in Alameda County (land owned by SFPUC and East Bay Regional Park District). Primary route may be along upper Calaveras Creek or Arroyo Hondo.	California red-legged frog, California tiger salamander, American badger, mountain lion, bobcat	L. Serpa pers. comm.; Jones & Stokes 2006; Thorne et al. 2002
5	Joseph Grant Co. Park to Henry W. Coe State Park	11.5	Provide connection between two large blocks of protected lands across a variety of land-cover types, possibly along San Felipe Creek.	California red-legged frog, California tiger salamander, American badger, Tule elk, mountain lion, bobcat, pronghorn,	State of California 1985; H. Coletto pers. comm.; Thorne et al. 2002
6	Coyote Ridge from Silver Creek Hills to Anderson Dam	9.5	Provide connectivity for serpentine species within core habitat along Coyote Ridge. Link patches of protected lands along the ridge.	Bay checkerspot butterfly, Mt. Hamilton thistle, Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, Santa Clara Valley dudleya, fragrant fritillary, Tiburon paintbrush, Opler's longhorn moth, Hom's and Jung's microblind harvestman	USFWS 1998c; J. Hillman pers. comm.; Weiss and Wright 2005; T. Marker pers. comm.; Also see species accounts in Appendix D

Table 5-9. Continued

Ref. # (Fig. 5-6)	Linkage (Listed Generally from North to South)	Approx. Length <sup>1</sup> (miles)	General Linkage Purpose	Covered and Other Native Species Likely to Use Linkage <sup>2</sup>	Sources
7	Coyote Ridge to Anderson Lake County Park and Henry W. Coe State Park	7.5	Provide connectivity along an elevation gradient and between protected open space along Coyote Ridge and large blocks of protected open space centered on Henry W. Coe State Park. Provide connectivity among stands of valley oak woodland at different elevations.	Tule elk, American badger, bobcat, Mt. Hamilton thistle, Santa Clara Valley dudleya	H. Coletto pers. comm.; Diamond 2006; T. Diamond pers. comm.; Also see species accounts in Appendix D
8	Santa Teresa Hills to Metcalf Canyon	3	Most northerly and narrowest connection between Diablo Range and the Santa Cruz Mountains. Provides important linkages for variety of mammals and invertebrates.	Bay checkerspot butterfly, Mt. Hamilton thistle, American badger, bobcat	Spencer et al. 2006; Diamond 2006; T. Diamond, pers. comm.; Coastal Training Program 2006; The Nature Conservancy 2006a
9	Calero Co. Park to Almaden Quicksilver County Park	1.5	Provides short linkage between two large County parks (and Open Space Authority lands) and provides linkage outside the study area to extensive protected lands in the Santa Cruz Mountains owned by Midpeninsula Regional Open Space District and the Peninsula Open Space Trust. May be the only viable grassland connection between extensive grassland in the two County parks.	American badger (?), bobcat, mountain lion, Mt. Hamilton thistle, most beautiful jewelflower, smooth lessingia, Loma Prieta hoita, Santa Clara Valley dudleya	See plant species accounts in Appendix D
10	Calero County Park to Coyote Lake-Harvey Bear Ranch County Park, across Tulare Hill/Santa Teresa Hills	18	Provides linkage from Coyote Ridge and Diablo Range to Santa Cruz Mountains via Tulare Hill or Fisher Creek.	Bay checkerspot butterfly, American badger, bobcat, mule deer	City of San Jose 2007; Coastal Training Program 2006; California Wilderness Coalition 2002
11	Llagas Creek from headwaters to confluence with Pajaro River	32	Provides access in wet years from Pajaro River to current and historic spawning and rearing habitat for resident and anadromous fish. Provides regional linkage for riparian birds into the study area from the south and the west. Also may provide local linkages for native amphibians and aquatic reptiles.	Steelhead trout, Pacific lamprey, Monterey roach, Sacramento sucker, Sacramento pikeminnow, western pond turtle, foothill yellow-legged frog, least Bell's vireo, bobcat, California red-legged frog (?)	Smith 2007; Also see species accounts in Appendix D



Table 5-9. Continued

Ref. # (Fig. 5-6)	Linkage (Listed Generally from North to South)	Approx. Length <sup>1</sup> (miles)	General Linkage Purpose	Covered and Other Native Species Likely to Use Linkage <sup>2</sup>	Sources
12	Uvas Creek from headwaters to confluence with Pajaro River	25.5	Provides access from Pajaro River to spawning habitat for resident and anadromous fish. Provides regional linkage for riparian birds into the study area from the south and the west. Also provides local linkages for native amphibians and aquatic reptiles. Provides linkage to outside the study area in Santa Cruz County and to the large and diverse Forest of Nisene Marks State Park.	Steelhead trout, Pacific lamprey, Monterey roach, Sacramento sucker, Sacramento pikeminnow, western pond turtle, least Bell's vireo, bobcat, California red-legged frog, foothill yellow-legged frog	Smith 2007; Also see species accounts in Appendix D
13	Uvas Canyon County Park to Pajaro River through Santa Cruz Mountains	15.5	Provides long-distance connection along spine of Santa Cruz Mountains within the study area (similar linkages identified nearby outside the study area). Provides important connectivity for redwood forest and associated plants. Links Mount Madonna County Park with Uvas Canyon County Park.	Bobcat, mountain lion, California red-legged frog, California tiger salamander, coast redwood	The Nature Conservancy 2006a; Thorne et al. 2002
14	Henry W. Coe State Park to San Felipe Lake	5	Provides closest link between upland habitat and San Felipe Lake, an important large wetland complex in San Benito County. Also provides linkage with high density of ponds between high-elevation habitats in Henry W. Coe State Park and low elevation uplands at edge of study area (i.e., strong environmental gradient).	California tiger salamander, California red-legged frog, western pond turtle, American badger (?), tricolored blackbird (?)	See species accounts in Appendix D
15	Henry W. Coe State Park southeast to San Benito County line	9	Provides linkage across Pacheco Creek and Highway 152 within the Diablo Range. Highway 152 is permeable to wildlife only in certain places (see text for details).	San Joaquin kit fox, mountain lion, bobcat, Tule elk (?), California tiger salamander, California red-legged frog, western pond turtle	Thorne et al. 2002; Also see species accounts in Appendix D
16	Romero Ranch to Henry W. Coe State Park	3.5	Provides connectivity between two large blocks of protected open space.	Mountain lion, bobcat, California tiger salamander, California red-legged frog, western pond turtle	See species accounts in Appendix D

Table 5-9. Continued

Ref. # (Fig. 5-6)	Linkage (Listed Generally from North to South)	Approx. Length <sup>1</sup> (miles)	General Linkage Purpose	Covered and Other Native Species Likely to Use Linkage <sup>2</sup>	Sources
17	Main stem of Pacheco Creek	12	Provides passage for resident and anadromous fish between Monterey Bay, the Pajaro River, and potential spawning and rearing habitat on south fork of Pacheco Creek and Cedar Creek. Passage through main stem of Pacheco Creek is restricted in dry years.	Steelhead trout, Pacific lamprey, California red-legged frog, Sacramento sucker, western pond turtle, mountain lion, bobcat, least Bell's vireo	Smith 2007; Also see species accounts in Appendix D
18	Santa Cruz Mountains to Diablo Range along Pajaro River	9.5	Provides movement habitat for anadromous fish between Monterey Bay and spawning habitat in the Pacheco Creek watershed. Also provides important linkage for upland and riparian wildlife between Diablo Range and Santa Cruz Mountains.	Steelhead trout, Pacific lamprey, California red-legged frog, western pond turtle, mountain lion, bobcat, least Bell's vireo, tricolored blackbird (?)	The Nature Conservancy 2006a; also see species accounts in Appendix D
19	Santa Cruz Mountains to Gabilan Range	4	Provides linkage from the Santa Cruz Mountains to the Gabilan Range in San Benito County. The only connection south from the Santa Cruz Mountains to the Santa Lucia Ranges to the south.	Mountain lion, bobcat, California red-legged frog	Coastal Training Program 2006; The Nature Conservancy 2006a; Thorne et al. 2002
20	Santa Cruz Mountains to Lomerias Muertas Range	4.5	Provides linkage from the Santa Cruz Mountains to the Lomerias Muertas Range in San Benito County.	Mountain lion, bobcat	The Nature Conservancy 2006a; Thorne et al. 2002

Notes:

<sup>1</sup> Approximate length within the study area.<sup>2</sup> Other native species identified in this column include species that depend on linkages for long-distance movement or to maintain large home ranges and for which data are available indicating the species may use the particular linkage. Common native species such as raccoon, opossum, coyote, and skunk would likely use all of the linkages and are less sensitive to land use changes within the linkages than the other native species identified.

**Table 5-10.** Conservation Analysis Zones and Land Cover Types (acres)

Land Cover Type	Conservation Analysis Zone								Grand Total
	Alameda	Coyote	Guadalupe	Llagas	Pacheco	Pescadero	San Tomas	Uvas	
California Annual Grassland	514	20,980	1,283	6,515	23,641	2,779	-	5,537	61,249
Serpentine Bunchgrass Grassland	-	4,535	991	930	123	7	-	419	7,005
Serpentine Rock Outcrop / Barrens	-	132	4	20	19	-	-	31	207
Serpentine Seep	-	4	3	7	7	-	-	-	21
Rock Outcrop	-	6	25	1	39	2	-	0	74
Northern Mixed Chaparral / Chamise Chaparral	-	8,728	101	1,216	4,901	193	-	2,551	17,691
Mixed Serpentine Chaparral	-	376	159	472	555	-	-	843	2,406
Northern Coastal Scrub / Diablan Sage Scrub	18	2,226	370	807	702	753	-	2,765	7,641
Coyote Brush Scrub	-	71	6	10	-	-	-	36	123
Valley Oak Woodland	256	2,955	104	285	3,887	17	-	454	7,958
Mixed Oak Woodland and Forest	299	13,337	1,395	3,193	22,605	1,337	-	8,397	50,563
Blue Oak Woodland	62	1,362	194	1,014	2,326	2	-	1,068	6,029
Coast Live Oak Forest and Woodland	179	8,571	731	3,746	4,148	998	-	5,050	23,421
Foothill Pine - Oak Woodland	-	3,688	-	10	1,942	-	-	797	6,437
Mixed Evergreen Forest	-	1	158	1,538	-	-	-	2,378	4,075
Willow Riparian Forest and Scrub	8	421	202	317	73	98	37	345	1,499
Central California Sycamore Alluvial Woodland	-	3	-	-	195	-	-	9	207
Mixed Riparian Forest and Woodland	-	548	226	453	586	56	-	1,053	2,921
Redwood Forest	-	-	-	108	-	927	-	5,576	6,611
Ponderosa Pine Woodland	-	4	-	0	-	-	-	-	5
Knobcone Pine Woodland	-	-	-	1	-	-	-	591	592
Coastal and Valley Freshwater Marsh	-	38	42	56	8	0	-	31	176
Seasonal Wetland	1	88	7	15	13	1	-	7	131
Pond	1	153	157	122	163	7	-	101	704
Reservoir	-	166	-	-	140	-	-	45	352

Table 5-10. Continued

Land Cover Type	Conservation Analysis Zone								Grand Total
	Alameda	Coyote	Guadalupe	Llagas	Pacheco	Pescadero	San Tomas	Uvas	
Orchard	-	659	114	1,252	172	-	-	406	2,603
Vineyard	2	1	-	846	307	-	-	228	1,385
Grain, Row-crop, Hay & Pasture, Disked/short-term	25	6,827	1,627	16,642	1,155	40	-	5,629	31,945
Agriculture developed / Covered Ag	-	450	-	1,149	23	-	-	300	1,922
Urban - Suburban	12	31,549	37,588	11,599	317	8	5,890	1,404	88,369
Rural - Residential	25	2,633	754	7,049	160	-	-	1,539	12,161
Golf Courses / Urban Parks	-	3,702	2,194	915	-	-	189	309	7,309
Landfill	-	208	73	-	82	-	-	-	364
Ornamental Woodland	-	6	-	14	20	-	-	55	95
Barren	-	152	-	-	-	-	-	40	191
<b>Grand Total</b>	<b>1,402</b>	<b>114,580</b>	<b>48,510</b>	<b>60,300</b>	<b>68,311</b>	<b>7,225</b>	<b>6,116</b>	<b>47,999</b>	<b>354,443</b>

**Table 5-11.** Land Acquisition and Enhancement Requirements within the Study Area for Selected Terrestrial Land-Cover Types (acres)

Land Cover Type <sup>1</sup>	Total in Study Area	Outside Type 1, 2, 3, 4 Open Space	Estimated and Allowable Impact <sup>2</sup>	Estimated Impact (%) of Total)	Remain Outside Type 1, 2, 3, 4 Open Space	Protection Requirements for Compensation & Contribution to Recovery <sup>3</sup>	Minimum Open Space Protected <sup>4</sup>			
							Habitat Plan Protection Requirements & Type 1		Habitat Plan Protection Requirements & Type 1, 2, 3	
							Area (acres)	% of Study Area	Area (acres)	% of Study Area
California Annual Grassland	81,795	60,411	2,006	2.5%	58,405	13,300	21,838	27%	34,116	42%
Serpentine Bunchgrass Grassland	10,308	6,296	550	5.3%	5,746	4,000	5,262	51%	7,605	74%
Serpentine Rock Outcrop/ Barrens	260	202	22	8.5%	180	120	126	49%	176	68%
Serpentine Seep	34	18	0.5	1.5%	17	10	11	32%	23	67%
Rock Outcrop	87	67	0.5	0.6%	66	10	20	23%	22	25%
Northern Mixed Chaparral/ Chamise Chaparral	23,763	17,959	86	0.4%	17,873	400	4,166	18%	6,166	26%
Mixed Serpentine Chaparral	3,712	2,276	131	3.5%	2,145	700	921	25%	2,069	56%
Northern Coastal Scrub/ Diablan Sage Scrub	10,306	7,286	178	1.7%	7,108	1,400	1,974	19%	4,318	42%
Valley Oak Woodland	12,895	7,847	201	1.6%	7,646	1,700	5,160	40%	6,729	52%
Mixed Oak Woodland and Forest	84,488	50,083	1,441	1.7%	48,642	7,100	23,622	28%	41,020	49%
Blue Oak Woodland	11,160	5,793	131	1.2%	5,662	1,100	5,363	48%	6,433	58%
Coast Live Oak Forest and Woodland	31,652	22,953	840	2.7%	22,113	2,900	6,055	19%	11,334	36%
Foothill Pine—Oak Woodland	10,960	6,822	46	0.4%	6,776	80	3,133	29%	4,216	38%
Mixed Evergreen Forest	5,775	3,970	50	0.9%	3,920	20	34	1%	1,826	32%
Redwood Forest	9,693	6,546	109	1.1%	6,437	10	14	0%	3,158	33%
Ponderosa Pine Woodland	419	5	0	0.0%	5	0	411	98%	414	99%
Knobcone Pine Woodland	711	573	8	1.1%	565	0	0	0%	137	19%
<b>Total</b>	<b>298,016</b>	<b>199,105</b>	<b>5,800</b>	<b>1.9%</b>	<b>193,305</b>	<b>32,850</b>	<b>78,112</b>	<b>26%</b>	<b>129,760</b>	<b>44%</b>

Notes:

<sup>1</sup> All terrestrial natural land cover types with permanent impacts have land acquisition requirements except for coyote brush scrub and knobcone pine woodland. Coyote brush scrub is not important for any covered species and it is an early-successional community. It will be acquired anyway in the course of meeting other requirements. Knobcone pine woodlands do not provide important habitat for the covered species; as such they are not targeted for acquisition. For ponderosa pine, no permanent impacts are anticipated to occur and nearly all of this terrestrial natural land cover type is protected as Type 1 open space. As such, it is not targeted for acquisition.

<sup>2</sup> Permanent impact only. Source = Table 4-2.

<sup>3</sup> These acreage requirements are the minimum necessary to compensate for impacts of covered activities and contribute to the recovery of covered species. Actual acquisitions of these land cover types is likely to be greater than these minimum requirements because the Plan also includes requirements for connectivity, protection of plant occurrences, and others that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types.

<sup>4</sup> Minimum Open Space = Habitat Plan requirement + existing open space.

**Table 5-12.** Required Preservation, Enhancement, Restoration and Creation Mitigation Ratios and Estimated Acquisition, Enhancement, Restoration, and Creation Requirements for Aquatic Land Cover Types

Land Cover Type	Maximum Allowable Permanent Impacts <sup>1</sup> (acres)	Preservation and Enhancement Requirements		Restoration or Creation Requirements		
		Required Preservation Ratio	Preservation Requirement to Offset Impacts <sup>1</sup> (acres)	Required Mitigation Ratio (in addition to preservation)		Estimated Total Restoration or Creation (acres)
				Restoration	Creation	
<b>Riparian forest and scrub</b>						
Willow riparian forest and scrub or mixed riparian forest and woodland <sup>3</sup>	289	2:1	578 <sup>2</sup>	1:1	–	289
Central California sycamore alluvial woodland	7	2:1	14	2:1	–	14
<b>Wetland</b>						
Coastal and valley freshwater marsh (perennial wetland)	25	2:1	50	1:1	–	25
Seasonal wetland <sup>3</sup>	15	2:1	30 <sup>3</sup>	2:1	–	30
<b>Open Water</b>						
Pond <sup>4</sup>	52	2:1	104	–	1:1	52
Total Aquatic Land Cover Types (acres)	388		776			410
Stream (miles)	9.4	3:1	28.2	1:1	–	9.4

Notes:

<sup>1</sup> Impact limits are based on Table 4-2 for permanent impacts only. Actual acquisition requirements will be based on field-delineated resources at impact sites and application of the required preservation ratios in this table. Restoration, creation, and enhancement of aquatic land cover is required in addition to preservation of aquatic land cover as mitigation for impacts. See Chapter 5 for details.

<sup>2</sup> Because these land cover types are dynamic and represent different points on a continuum of vegetation succession, acquisition requirements for willow riparian woodland and scrub and mixed riparian woodland and forest are considered together and can be counted against either type of impact.

<sup>3</sup> Seasonal wetland acreage was quantified as the minimum polygon encompassing clusters of seasonal pools or drainages (i.e., wetland complexes). Impacts and land acquisition requirements will be tracked by the wetland delineation submitted in the Application Package described in Chapter 6, Section 6.8 and verified by the local jurisdiction, so estimates in this table overstate the expected impacts to and preservation of these land cover types. .

<sup>4</sup> Pond creation to mitigate for impacts will be accomplished by creating ponds of approximately the same size as those lost. Pond creation to contribute to recovery will be accomplished by creating ponds with an approximate average size of a 0.5 acre.

**Table 5-13.** Acquisition, Restoration, and Creation Requirements for all Land-Cover Types (acres)

Land Cover Type	Total in Study Area	Estimated and Allowable Permanent Impact <sup>1</sup>	Estimated Impact (% of Total)	Min. Protection Requirements for Contribution to Recovery <sup>2</sup>	Min. Habitat Restoration or Creation Requirements to Contribute to Recovery <sup>3</sup>	Min. Protection, Restoration, and Creation Requirements	Required Protection if All Impacts Occur <sup>4</sup>	Required Restoration or Creation if All Impacts Occur <sup>3</sup>	Total Protection, Restoration, and Creation if All Impacts Occur
Land Cover Types with Acquisition, Restoration, or Creation Requirements									
California annual grassland	81,795	2,006	2.5%	13,300	-	13,300	13,300	-	13,300
Serpentine bunchgrass grassland	10,308	550	5.3%	4,000	-	4,000	4,000	-	4,000
Serpentine Rock Outcrop/ Barrens	260	22	8.5%	120	-	120	120	-	120
Serpentine Seep	34	0.5	1.5%	10	-	10	10	-	10
Rock Outcrop	87	0.5	0.6%	10	-	10	10	-	10
Northern Mixed Chaparral / Chamise Chaparral	23,763	86	0.4%	400	-	400	400	-	400
Mixed Serpentine Chaparral	3,712	131	3.5%	700	-	700	700	-	700
Northern Coastal Scrub / Diablan Sage Scrub	10,306	178	1.7%	1,400	-	1,400	1,400	-	1,400
Valley Oak Woodland	12,895	201	1.6%	1,700	-	1,700	1,700	-	1,700
Mixed Oak Woodland and Forest	84,488	1,441	1.7%	7,100	-	7,100	7,100	-	7,100
Blue Oak Woodland	11,160	131	1.2%	1,100	-	1,100	1,100	-	1,100
Coast Live Oak Forest and Woodland	31,652	840	2.7%	2,900	-	2,900	2,900	-	2,900
Foothill Pine - Oak Woodland	10,960	46	0.4%	80	-	80	80	-	80
Mixed Evergreen Forest	5,775	50	0.9%	20	-	20	20	-	20
Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland	6,310	289	4.6%	250	50	300	578	339	917
Central California Sycamore Alluvial Woodland	373	7	1.9%	40	-	40	40	14	54
Redwood Forest	9,693	109	1.1%	10	-	10	10	-	10
Coastal and Valley Freshwater Marsh (Perennial Wetland)	381	25	6.6%	10	20	30	50	45	95
Seasonal Wetland	201	15	7.4%	5	-	5	30	30	60
Pond	1,110	52	4.7%	50	20	70	104	72	177
Subtotal	305,262	6,180	2.0%	33,205	90	33,295	33,652	501	34,153
Streams (miles)	2,392	9.4	0.4%	100.0	1.0	101.0	100.0	10.4	110.4

Table 5-13. Continued

Land Cover Types without Acquisition, Restoration, or Creation Requirements									
Coyote brush scrub	180	10	5.5%	-	-	-	-	-	-
Ponderosa Pine Woodland	419	0	0.0%	-	-	-	-	-	-
Knobcone Pine Woodland	711	8	1.1%	-	-	-	-	-	-
Reservoir	2,767	0	0.0%	-	-	-	-	-	-
Orchard	2,697	625	23.2%	-	-	-	-	-	-
Vineyard	1,393	37	2.6%	-	-	-	-	-	-
Agriculture developed / covered	1,935	0	0.0%	-	-	-	-	-	-
Grain, row-crop, hay and pasture,	33,648	7,356	21.9%	-	-	-	-	-	-
Urban-suburban	89,438	0	0.0%	-	-	-	-	-	-
Rural - residential	12,414	1,603	12.9%	-	-	-	-	-	-
Barren	211	32	15.2%	-	-	-	-	-	-
Landfill	364	0	0.0%	-	-	-	-	-	-
Golf courses / urban parks	8,673	2,095	24.2%	-	-	-	-	-	-
Ornamental woodland	95	30	31.3%	-	-	-	-	-	-
Subtotal	154,944	11,795	7.6%	-	-	-	-	-	-
<b>TOTAL</b>	<b>460,205</b>	<b>17,975</b>	<b>3.9%</b>	<b>33,205</b>	<b>90</b>	<b>33,295</b>	<b>33,652</b>	<b>501</b>	<b>34,153</b>

Notes:

<sup>1</sup> Source: Table 4-2.

<sup>2</sup> These acreage requirements are the minimum necessary to compensate for impacts of covered activities and contribute to the recovery of covered species, regardless of the actual level of impact. Sources: Tables 5-11 and 5-12. Actual acquisitions of these land cover types is likely to be greater than these minimum requirements because the Plan also includes requirements for connectivity, protection of plant occurrences, and others that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types. Requirements for acquisition of Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland are 250 acres of either type; for the purposes of this table the requirement is split in half (see Table 5-12).

<sup>3</sup> Habitat restoration and creation requirements apply only to riparian, wetlands, pond, and stream land cover types. See Table 5-12 for details.

<sup>4</sup> Compensatory protection applies only to riparian, pond, and wetland land cover types (see Table 5-12). Values are the maximum compensation estimated if all impacts of covered activities occur to these land cover types. The estimate for Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland is a joint requirement and is split for this table. These values are inclusive of the acres in the proceeding Minimum Protection Requirements for Contribution to Recovery (see Section 5.3.1, subtitle *Acquisition and Restoration Requirements for Aquatic Land Cover Types* for rationale).



**Table 5-14.** Commitments by Time Period for Restoration and Creation Requirements that Contribute to Species Recovery

Land Cover Types	Restoration/ Creation Requirements to Contribute to Recovery <sup>1</sup>	Restoration/ Creation Commitments by Time Period (acres, except where noted)		
		Year 15	Year 30	Year 40 <sup>2</sup>
Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland	50	18.8	37.5	50
Coastal and Valley Freshwater Marsh	20	7.5	15.0	20
Pond	20	7.5	15.0	20
<b>Total</b>	<b>90</b>	<b>33.8</b>	<b>67.5</b>	<b>90</b>
Streams (miles)	1.0	0.3	0.7	1.0

Notes:

<sup>1</sup> Source: Table 5-13. For wetland and riparian land cover types, timing targets in this table apply to contributions to recovery; preservation and restoration required due to impacts is tied to the Stay-Ahead provision.

<sup>2</sup> All land acquisition must be completed by Year 45. All habitat restoration must be completed by Year 40.

**Table 5-15.** Minimum Distance from Urban Development<sup>1</sup> Required for Aquatic Land Cover Types to Count Toward Land Acquisition or Restoration/Creation Requirements

Land Cover Type	Minimum Distance from Dense Urban Development Required for Credit	Rationale and Sources
Coastal and valley freshwater marsh	750 feet	Perennial wetlands may support a variety of covered species including tricolored blackbird, California red-legged frog, western pond turtle, and California tiger salamander. Tricolored blackbirds may be sensitive to disturbance and predation from urban pets and aquatic amphibians rely on adjacent upland habitats for nesting and non-breeding season refugia, so a relatively large buffer is required. Though amphibians have been documented traveling great distances from aquatic breeding sites (Reese 1996 [Western pond turtle]; Trenham and Shafer 2005 [California tiger salamander] there is a gradual reduction of upland occurrence as distance from the aquatic feature increases. Trenham and Shafer (2005) captured 50% of California tiger salamander adults within 150 m (492 ft) and 90% within 490 m (1608 ft) from aquatic breeding habitat. A 750-foot buffer between aquatic habitat and urbanization could reasonably support more than 50% of individuals breeding in the wetland/pond if suitable upland habitat was available.
Seasonal wetland	100 feet if wetland is up-gradient from development; 250 feet if wetland is down-gradient of development	Habitat function may decline if seasonal wetlands are located within 100 feet of dense urban development. Hydrologic effects of development can be more severe if seasonal wetland is located down-gradient. Seasonal wetlands, as defined by the Plan, are unlikely to support covered species because their hydroperiod is often shorter than the breeding time required by covered aquatic species. As a result, buffer requirements are based more on ecosystem function rather than species needs.
Pond	750 feet from pond edge	This is the approximate distance below which available upland habitat for pond-breeding covered species begins to diminish substantially (Reese 1996 [Western pond turtle]; Trenham 2001[California tiger salamander]; Semlitsch and Bodie 2003 [amphibians]).
Stream <sup>2</sup>	150 feet from top of bank	This setback is recommended by many authors to maintain stream physical properties (e.g., sediment and nutrient reduction, moderation of stream temperature, channel complexity), salmonid habitat, plant diversity, and other functions.
Riparian woodland/scrub (any land cover type)	50 feet from vegetation dripline	The minimum setback required in Condition 11 (Chapter 6) from the riparian dripline is 50 feet. The land acquisition credit limit accounts for the loss of riparian habitat function within this buffer and the estimated loss of some value for riparian birds and amphibians beyond it.

Notes:

<sup>1</sup> Urban development is defined as the planning limit of urban growth. Development within County jurisdiction outside the planning limit of urban growth triggers these restrictions if that development is as dense as that found within the planning limit of urban growth.

<sup>2</sup> Applies to land acquisition requirement only. Stream restoration can be accomplished within urban areas at any distance from dense urban development for stream restoration credit under the Habitat Plan.

**Table 5-16.** Species Occurrences, Impacts, and Conservation Requirements for Covered Plants

Covered Species	Current Known Occurrences <sup>1,2</sup>			Occurrences in Study Area During Plan Implementation <sup>3</sup>		Plant Occurrence Impacts and Conservation					Total Occurrences Protected in Reserve System	
	Extant in California	Study Area	Type 1 Open Space <sup>4</sup>	Additional Occurrences Found (relative to baseline)	Total in Study Area	Total Maximum Impacted <sup>5</sup>	Mitigation Ratio <sup>6</sup>	Protected per Mitigation Ratio	Protected to Contribute to Recovery <sup>7</sup>	Total Protected in Reserve System <sup>8</sup>	Acquired <sup>9</sup>	Allowable Creation in lieu of New Occurrence Acquisition <sup>10</sup>
Tiburon Indian paintbrush	9	2	0	–	2	0	N/A	–	1	1	1	–
Coyote ceanothus	3	3	0	–	3	0 <sup>11</sup>	N/A	–	5	5	3	2
Mt. Hamilton thistle	48	40	2	0	40	6	3:1	18	4	22	22	–
				6	46	7		21		25	25	–
				12	52	8		24		28	28	–
Santa Clara Valley dudleya	209	207	2	0	207	11	4:1	44	11	55	55	–
				6	213	12		48		59	59	–
				12	219	13		52		63	63	–
				18	225	14		56		67	67	–
Fragrant fritillary	59	8	0	0	8	1	3:1	3	1	4	4	–
				5	13	2		6		7	7	–
				10	18	3		9		10	10	–
Loma Prieta hoita	26	14	1	0	14	0	2:1	0	4	4	4	–
				3	17	1		2		6	6	–
				6	20	2		4		8	8	–
Smooth lessingia	39	39	3	0	39	6	2:1	12	12	24	12	12
				7	46	7		14		26	14	
				10	49	8		16		28	16	
				13	52	9		18		30	18	
Metcalf Canyon jewelflower	11	10	1	–	10	2	N/A	–	10	13	3	10
Most beautiful jewel-flower	86	39	3	0	39	6	2:1	12	5	17	17	–
				4	43	7		14		19	19	–
				8	47	8		16		21	21	–

Table 5-16. Continued

Covered Species	Current Known Occurrences <sup>1,2</sup>			Occurrences in Study Area During Plan Implementation <sup>3</sup>		Plant Occurrence Impacts and Conservation					Total Occurrences Protected in Reserve System	
	Extant in California	Study Area	Type 1 Open Space <sup>4</sup>	Additional Occurrences Found (relative to baseline)	Total in Study Area	Total Maximum Impacted <sup>5</sup>	Mitigation Ratio <sup>6</sup>	Protected per Mitigation Ratio	Protected to Contribute to Recovery <sup>7</sup>	Total Protected in Reserve System <sup>8</sup>	Acquired <sup>9</sup>	Allowable Creation in lieu of New Occurrence Acquisition <sup>10</sup>

Notes:

<sup>1</sup> See Chapter 3 for data sources.

<sup>2</sup> For the purposes of this Plan and the analyses, occurrences are equivalent to populations for all species except for Santa Clara Valley dudleya.

<sup>3</sup> More occurrences may be found during Plan implementation than were known during Plan preparation (baseline). These columns represent the minimum number of known occurrences that must be known in the study area before impacts described in the subsequent column can occur. The first line for each species accounts for occurrences known at the time of permit issuance. “Additional Occurrences Found” refers to the number of additional occurrence found during the permit term. “Total in Study Area” is the number of additional occurrence found during the permit term plus the number of occurrence known during Plan preparation.

<sup>4</sup> Occurrences that are only partially in open space are not included in totals.

<sup>5</sup> Occurrences are considered impacted if the occurrence is removed or a qualified biologist determines that occurrence viability will be reduced as a result of covered activities, as further described in Chapter 6, Condition 20. Impacts solely associated with implementation of the conservation strategy are not reflected in this column as those impacts will be minor and temporary in nature and will have a net benefit to the species. No new occurrence acquisition will allow additional impacts beyond what is listed in this table. Refer to Chapter 4 for full explanation of impacts by species.

<sup>6</sup> Mitigation ratios were only developed for species for which additional impacts could occur in the event that additional occurrences are found during the permit term. Ratios were calculated as the number of occurrences acquired if no additional occurrences were discovered during the permit term by the total maximum occurrences that could be impacted if no additional occurrences were discovered during the permit term. The mitigation ratio represents the number of occurrences that must be acquired prior to each impact, including the first impact. Species-specific requirements regarding timing of mitigation/conservation relative to impact are provided in Section 5.4 for the Tiburon Indian paintbrush, Coyote ceanothus, and Metcalf Canyon jewelflower.

<sup>7</sup> Recovery actions will occur regardless of impacts; however, acquisition activities performed for mitigation purposes can count toward recovery once the total mitigation obligation is achieved.

<sup>8</sup> With the exception of the Coyote ceanothus (see Section 5.4.11), all occurrences acquired or created in this Plan will be permanently protected within the Reserve System with a conservation easement and/or will be owned in fee by the Implementing Entity. The first row for each species in this column represents the minimum requirement of acquisition and creation regardless of the number of occurrences impacted (e.g., if no additional occurrences of Mt. Hamilton thistle are found during Plan implementation, the Implementing Entity will acquire 22 occurrences for the Reserve System even if less than six occurrences are impacted during the permit term).

<sup>9</sup> Acquisition of naturally-occurring occurrences could occur through fee title and/or conservation easement. Occurrences could be on land newly acquired under the Habitat Plan or on existing open space that is incorporated into the Reserve System. Occurrences must be acquired prior to impacts, with the exception of the Coyote ceanothus (see Section 5.4.11).

<sup>10</sup> For occurrence preservation, priority will always be given to acquisition, however, if acquisition is infeasible, creation is allowed as stipulated in Section 5.4. The decision to focus conservation effort on occurrence creation will be made jointly with the Wildlife Agencies. Creation will be completed by Year 40, acquisition will be completed by Year 45.

<sup>11</sup> Impacts are allowed to no more than 3,650 individuals or 5% of the population adjacent to Anderson Dam, whichever is smaller. This standard will be applied to the population as it existed during the 2009 surveys. It will not be applied to any new recruits that are a result of natural or artificial disturbance event such as fire.

**Table 5-17.** Commitments to Acquire and Enhance Modeled Habitat in the Reserve System for Covered Species with Models (acres)

Species and Habitat Type	Habitat in Study Area (acres) <sup>1</sup>	Modeled Habitat in Type 1 Open Space		Modeled Habitat in Type 1,2, and 3 Open Space		Commitment to Acquire Modeled Habitat for Reserve System (acres)	Maximum Modeled Habitat added to the Reserve System from Existing Open Space (acres) <sup>2</sup>	Total Protected in Reserve System and Type 1 Open Space		Total in Reserve System and Type 1, 2, and 3 Open Space	
		Area (acres)	Proportion (%)	Area (acres)	Proportion (%)			Amount (acres)	Proportion (%)	Amount (acres)	Proportion (%)
<b>Bay Checkerspot Butterfly</b>											
Primary Habitat	8,621	1,336	15%	2,921	34%	3,800	754	5,890	68%	6,721	78%
<b>California Tiger Salamander</b>											
Breeding Habitat	1,027	100	10%	403	39%	150	45	295	29%	553	54%
Non-breeding Habitat	323,721	45,667	14%	97,020	30%	30,000	11,700	87,367	27%	127,020	39%
Total	324,748	45,767	14%	97,423	30%	30,150	11,745	87,662	27%	127,573	39%
<b>California Red-Legged Frog</b>											
Primary Habitat	10,101	730	7%	3,230	32%	1,300	130	2,160	21%	4,530	45%
Secondary Habitat	331,672	45,523	14%	97,934	30%	30,000	11,800	87,323	26%	127,934	39%
Total	341,773	46,253	14%	101,164	30%	31,300	11,930	89,483	26%	132,464	39%
<b>Foothill Yellow-Legged Frog (length in miles)</b>											
Primary Habitat	244	37	15%	70	29%	30	7	74	30%	100	41%
Secondary Habitat	447	82	18%	152	34%	50	17	149	33%	202	45%
Total	690	119	17%	222	32%	80	24	222	32%	302	44%
<b>Western Pond Turtle</b>											
Primary Habitat	82,895	13,900	17%	28,568	34%	7,000	2,800	23,700	29%	35,568	43%
Secondary Habitat	232,021	31,067	13%	69,491	30%	20,000	9,100	60,167	26%	89,491	39%
Total	314,916	44,967	14%	98,060	31%	27,000	11,900	83,867	27%	125,060	40%
<b>Western Burrowing Owl</b>											
Overwintering Habitat	132,770	12,584	9%	28,517	21%	17,000	4,310	33,894	26%	45,517	34%
Occupied and Potential Nesting Habitat <sup>3</sup>	65,099	1,003	2%	9,284	14%	5,300	0	6,303	10%	14,584	22%
Total	197,869	13,586	7%	37,802	19%	22,300	4,310	40,196	20%	60,102	30%
<b>Tricolored Blackbird</b>											
Primary Habitat	7,933	295	4%	2,546	32%	1,000	40	1,335	17%	3,546	45%
Secondary Habitat	132,358	10,742	8%	26,888	20%	18,000	3,800	32,542	25%	44,888	34%
Total	140,291	11,037	8%	29,435	21%	19,000	3,840	33,877	24%	48,435	35%
<b>Least Bell's Vireo</b>											
Primary Habitat	3,097	65	2%	330	11%	460	2	527	17%	790	26%
<b>San Joaquin Kit Fox</b>											

Table 5-17. Continued

Species and Habitat Type	Habitat in Study Area (acres) <sup>1</sup>	Modeled Habitat in Type 1 Open Space		Modeled Habitat in Type 1,2, and 3 Open Space		Commitment to Acquire Modeled Habitat for Reserve System (acres)	Maximum Modeled Habitat added to the Reserve System from Existing Open Space (acres) <sup>2</sup>	Total Protected in Reserve System and Type 1 Open Space		Total in Reserve System and Type 1, 2, and 3 Open Space	
		Area (acres)	Proportion (%)	Area (acres)	Proportion (%)			Amount (acres)	Proportion (%)	Amount (acres)	Proportion (%)
Secondary Habitat	38,543	5,067	13%	6,012	16%	4,000	0	9,067	24%	10,012	26%
Secondary Habitat (Low Use)	2,349		0%	303	13%	100	0	100	4%	403	17%
Total	40,892	5,067	12%	6,315	15%	4,100	0	9,167	22%	10,415	25%
<b>Mt. Hamilton Thistle</b>											
Primary Habitat	487	55	11%	204	42%	150	60	265	54%	354	73%
<b>Fragrant Fritillary</b>											
Primary Habitat	8,820	1,025	12%	3,074	35%	3,000	1,000	5,025	57%	6,074	69%
Secondary Habitat	156,635	15,346	10%	39,243	25%	20,000	3,000	38,346	24%	59,243	38%
Total	165,455	16,371	10%	42,317	26%	23,000	4,000	43,371	26%	65,317	39%
<b>Loma Prieta Hoita</b>											
Primary Habitat	104,126	15,133	15%	34,426	33%	9,000	3,500	27,633	27%	43,426	42%
Secondary Habitat	17,745	2,143	12%	4,241	24%	1,000	600	3,743	21%	5,241	30%
Total	121,871	17,276	14%	38,667	32%	10,000	4,100	31,376	26%	48,667	40%
<b>Smooth Lessingia</b>											
Primary Habitat	10,491	1,268	12%	3,659	35%	4,000	1,100	6,368	61%	7,659	73%
<b>Metcalf Canyon Jewelflower</b>											
Primary Habitat	8,105	984	12%	2,843	35%	3,200	1,000	5,184	64%	6,043	75%
<b>Most Beautiful Jewelflower</b>											
Primary Habitat	14,277	1,490	10%	5,030	35%	4,000	1,700	7,190	50%	9,030	63%
Secondary Habitat	85	10	12%	12	14%	0	0	11	13%	12	14%
Total	14,362	1,500	10%	5,042	35%	4,000	1,700	7,201	50%	9,042	63%

<sup>1</sup> All area measurements are in acres unless otherwise noted.

<sup>2</sup> County Park lands added to Reserve System and converted from Type 2 or 3 Open Space to Type 1 (see Table 5-5) within the Reserve System would be enhanced, where appropriate. A maximum of 13,291 acres of existing open space could be credited toward the Reserve System size under the Plan. Additional acres of existing open space could be incorporated into the Reserve System; however, they would not receive credit toward the Reserve System size. Alternatively, the Implementing Entity may acquire new lands for the Reserve System in place of adding this acreage from existing open space, as long as the total Reserve System size requirements are met.

<sup>3</sup> Western burrowing owl modeled occupied nesting and potential nesting modeled habitat is quantified inside the study area only. The Implementing Entity will manage a minimum of 5,300 acres of western burrowing owl nesting (occupied and potential) habitat throughout the permit area by the end of the permit term. Of this acreage, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement as part of the Reserve System. For the remaining 4,700 acres, land acquisition (fee title or easement) or management agreements may be used and the land may not be part of the Reserve System. However, lands not acquired will be under permanent management agreements by year 45. Additional detail is provided in Chapter 5 and Appendix M.

**Table 5-18.** Land Acquisition and Enhancement Requirements for Selected Conservation Analysis Zones (acres)

Conservation Analysis Zone <sup>1</sup>	Natural Land Cover		Proportion (%)
	Natural Land Cover Types in Zone(s) (acres)	Acquisition Requirement in Zone(s) (acres)	
Alameda 1	1,338	--	--
Coyote 7	4,567	--	--
Subtotal <sup>2</sup>	5,905	2,300	39%
Coyote 4	9,146	4,200	46%
Subtotal	9,146	4,200	46%
Uvas 1	10,891	1,000	9%
Uvas 2	8,573	800	9%
Uvas 3	4,761	--	--
Uvas 4	4,357	--	--
Uvas 5	8,630	4,600	53%
Uvas 6	831	200	24%
Subtotal	38,043	6,600	17%
Pacheco 1	9,093	--	--
Pacheco 2	7,535	--	--
Pacheco 3	5,849	--	--
Pacheco 4	5,477	--	--
Pacheco 5	12,959	--	--
Pacheco 6	8,278	--	--
Subtotal <sup>2</sup>	49,190	2,400	5%
Coyote 2	4,954	900	18%
Pacheco 7	5,037	800	16%
Pacheco 8	11,706	3,800	32%
Subtotal	21,697	5,500	25%
<b>Total<sup>3</sup></b>	<b>123,981</b>	<b>21,000</b>	<b>17%</b>

Notes:

<sup>1</sup> Conservation Analysis Zones with separate land acquisition requirements were selected based on the need to be more geographically specific to achieve conservation goals and objectives.

<sup>2</sup> Land acquisition can be achieved in any applicable conservation analysis zone to meet the requirements in the subtotal.

<sup>3</sup> Total land acquisition requirement for these conservation analysis zones overlap with land acquisition requirements for land cover types in Tables 5-11 and Table 5-13. Land acquisition requirements by conservation analysis zone include both terrestrial and wetland land cover types.

**Table 5-19.** Land Acquisition and Enhancement Requirements for Serpentine Grassland in the Study Area

Conservation Analysis Zone <sup>1</sup>	Serpentine Grassland in Zone(s) (acres)	Serpentine Grassland Acquisition Requirement in Zone(s) (acres)	Proportion (%)
Guadalupe 1 and 3	980	500	51%
Guadalupe 2	11	-	0%
Coyote 3	21	-	0%
Coyote 4	131	100	76%
Coyote 5	2,655	1,900	72%
Coyote 6	1,735	900	52%
Coyote 7	22	-	0%
Coyote 9	66	-	0%
Coyote 10	153	-	0%
Llagas 2	299	200	67%
Llagas 3	583	100	17%
Llagas 4	32	-	0%
Llagas 5	16	-	0%
Uvas 1	147	-	0%
Uvas 2	42	-	0%
Uvas 3	38	-	0%
Uvas 4	10	-	0%
Uvas 5	175	-	0%
Uvas 6	8	-	0%
Pescadero 1	7	-	0%
Pacheco 5	50	-	0%
Pacheco 6	73	-	0%
Any Conservation Analysis Zone		300	
<b>Total</b>	<b>7,254</b>	<b>4,000</b>	<b>55%</b>

Notes:

<sup>1</sup> Only those conservation analysis zones with serpentine grassland are shown.



**Table 5-20.** Management Consideration for Significant Invasive Plants in the Plan Area

Species	Management Considerations
Non-native Annual Grasses (multiple species)	<p>The grasslands of the region are overwhelmingly dominated by very aggressive weedy grasses and forbs that evolved under extreme grazing pressure in the Mediterranean region of Southern Europe, North Africa, and the Middle East before invading and replacing the native California grasslands. The annual-dominated grasslands that we have today are quite different in significant ways from the native grasslands of the past—different species, different animal herbivory and traffic, and different management by people. Without management (mostly with livestock grazing), these aggressive plants grow tall and dense (even in serpentine), choking out the habitat structure that allowed the currently endangered plants and animals to survive through the last 250 or more years. Grazing still controls the growth of these plants in their native grasslands around the Mediterranean Sea, and in California has facilitated the persistence of a host of endangered species in our grasslands.</p> <p><b>Grazing Management.</b> The existing science of grasslands and their management tells us that some kind of grazing is far better than none, for multiple conservation purposes, including maintenance of habitat for grassland-dependent special-status species. Grazing termination or exclusion has led to local extirpations of endangered species, particularly during years of above-normal precipitation (e.g., Bay checkerspot butterfly). Research and experience has shown that grazing can be prescribed more precisely to create and maintain the desired habitat structure for special-status species, fire fuel patterns, and reduction of pest plants, while minimizing impacts. Livestock’s role in grassland conservation and grazing management, as well as the fire, mechanical, and herbicide treatment options are described in text.</p>
Barbed goatgrass ( <i>Aegilops triuncialis</i> )	<p><b>Grazing Management (risks of spread/timing/intensity).</b> Small infestations can be spread quickly by attachment of the barbed seeds to livestock and wildlife, and by distribution of livestock replacement hay. Heavy grazing during the growing period, followed by late-spring rest has increased the density of this pest. Heavy grazing during the early growing season can be effective in limiting seed production.</p> <p><b>Fire.</b> Thorough late-spring burning of infested patches, where there is abundant herbaceous fuels and before seedheads have emerged, has been effective. Multiple burns are required because of persistence of a viable seedbank.</p> <p><b>Mechanical.</b> Mowing has been less effective than grazing because prostrate plants escape injury. Mowing during the early growing season can be effective in limiting seed production.</p> <p><b>Herbicides.</b> Glyphosate can be effective if the infestations are small and found early. This herbicide can be effective if used in the winter or spring, but repeated applications are likely to be necessary to deplete the seedbank.</p>
Black mustard ( <i>Brassica nigra</i> )	<p><b>Grazing Management (Timing/Intensity).</b> Disturbance, including excessive grazing, promotes the dominance and spread of black mustard. The fast growing, fibrous stems and branches of black mustard are generally not preferable to livestock. Black mustard favors nutrient-rich soils that are especially prevalent in areas used by cattle. Once dominance by black mustard is established, allelopathic chemicals leaching from dead stalks and tissues further prevents the establishment of other plants.</p> <p><b>Fire.</b> Dense black mustard stands may increase the fire frequency as plants are extremely flammable upon desiccation. There is no evidence in the available literature that prescribed burning is an effective technique to control black mustard infestations. The increased nitrification of soil and lack of viable competitors may increase the level of infestation.</p> <p><b>Mechanical.</b> Mowing and hand pulling is very effective for controlling relatively small populations of black mustard. Mowing should be timed for early spring, prior to the production of viable seeds.</p> <p><b>Herbicides.</b> 2-4-D and glyphosphate are both effective herbicides for control of black mustard. These are best applied to rosettes immediately after mowing.</p>

Species	Management Considerations
Italian thistle ( <i>Carduus pycnocephalus</i> )	<p><b>Grazing Management (Timing/Intensity).</b> Although cattle grazing has demonstrated limited success in controlling Italian thistle, properly timed grazing will minimize the spread of seed and slow the rate of infestation. Light to moderate intensity early to mid-spring grazing prior to the production of flowering heads is preferable and will minimize soil disturbance and nitrification of soil, which favors Italian thistle establishment and spread.</p> <p><b>Fire.</b> Very little data supports the use of fire as an effective mechanism for Italian thistle control. Many ecologists have observed dramatic increases in the size of Italian thistle infestations following fire. This is likely due to the increased nutrients released into the soils and lack of competition from other annual plants. However, similar to YST, burning over 2 or more consecutive years is likely to reduce the viable seedbank and decrease the size and density of Italian thistle colonies. This strategy is best used as part of an integrated pest management program.</p> <p><b>Mechanical.</b> For relatively small infestations of Italian thistle, mowing is the preferred method for control. This technique requires mowing before seed production over several consecutive years (or even within years). Slashing is even more effective because more of the above ground plant material is removed. Italian thistle has been shown to readily flower in plants that are cut at or above 8 cm above the ground. Further, if plants are cut too close to flowering, they can still produce viable seed after they have been mowed. Hand hoeing is the most effective technique for small patches, especially if roots are severed 10 cm below the ground surface because plants will not resprout in the same growing season.</p> <p><b>Herbicides.</b> Herbicides are most effective in combination with other weed management techniques. 2-4-D has shown some success and is best applied directly to the roots when thistles are less than 0.25m.</p>
Yellow star thistle ( <i>Centaurea solstitialis</i> )	<p><b>Grazing Management. (Timing/Intensity).</b> Cattle grazing must occur prior to blooming period of spiny flower heads. High intensity early spring grazing followed by mowing/herbicide application is an effective method for control although full eradication is highly improbable.</p> <p><u>Note:</u> Goats are preferable to cattle because they will browse on spiny flower heads later in the year. Yellow star thistle is highly toxic and may be fatal to horses.</p> <p><b>Fire.</b> Prescribed burning has proven effective only after repeated burns over 2 or more consecutive years. Otherwise, fire is counterproductive and will increase germination and spread of YST due to increased light penetration and soil warming resulting from the removal of thatch and other competing plant species. Prescribed burning in a single year may be effective as part of an integrated pest management strategy including mowing and herbicides.</p> <p><b>Mechanical.</b> Although labor intensive and time consuming, mowing is an effective strategy for controlling yellow star thistle after plants have bolted but prior to the production of viable seeds. This technique is most effective for small, isolated populations.</p> <p><b>Herbicides.</b> Clopyralid is the most effective herbicide for full season control of YST registered for use in California. Unlike most post-emergence herbicides, it provides both foliar and soil activity. The best timing for application is when YST is in the early rosette stage. Glyphosphate (Roundup) is useful for control after plants have bolted. Herbicides are best utilized as part of an integrated pest management program.</p>
Bull thistle ( <i>Cirsium vulgare</i> )	<p><b>Grazing Management (Timing/Intensity).</b> Cattle will not consume bull thistle due to long, stiff spines at the end of the leaves and subtending the flowers. However, bull thistle tends to colonize in disturbed overgrazed areas including wallows near water troughs.</p> <p><b>Fire.</b> Biennial forbs, including most thistles, require burning over 2 or more consecutive years for effective control. A single fire will likely increase the level of bull thistle infestation.</p> <p><b>Mechanical.</b> Repeated mowing will control infestations of bull thistle, but mowing must be timed before the production of flowers</p>

Species	Management Considerations
	<p>and viable seeds.</p> <p><b>Chemical.</b> 2-4-D, clopyralid, picloram, and dicamba are effective herbicides for controlling bull thistle. Herbicide application is most effective when applied to rosettes prior to the production of flowers and viable seeds.</p>
Common teasel ( <i>Dipsacus fullonum</i> )	<p><b>Grazing Management (Exclusion).</b> In general, spiny flower-heads are natural deterrent to cattle grazing. Dense infestations are generally impenetrable to livestock. There is evidence that cattle will not consume teasel prior to flower production due to the bitter taste and spiny leaves. However, because teasel is spread by seed, cattle may incidentally translocate seeds and spread teasel to other sites. Disturbance and denuded vegetation from heavy grazing is also likely to facilitate teasel establishment due to increased nutrients (nitrification) and lack of competition from other plants.</p> <p><b>Fire.</b> Late spring prescribed burns may be somewhat effective for teasel control. However, because fire will not carry well through dense stands of mature plants, fire alone will not eradicate teasel. Prescribed burning may make it easier to locate rosettes for mechanical or chemical control.</p> <p><b>Mechanical.</b> Mowing prior to the production of mature flowers is effective for control of teasel, but will not eradicate common teasel. Hand pulling or mattocking is preferable due to full removal of perennial root systems.</p> <p><b>Chemical.</b> 2-4-D applied in the spring to rosettes prior to mature flower production is effective for teasel eradication. This strategy is best used in combination with mowing as part of an integrated pest management program.</p>
Blue gum eucalyptus ( <i>Eucalyptus globulus</i> )	<p><b>Grazing Management. (None).</b> Eucalyptus displaces native plant communities/wildlife habitat due to rapid establishment and growth. Allelopathic properties in the leaves and stems prevent recruitment of all but the hardiest understory vegetation. Eucalyptus will rapidly invade grasslands, reducing the available forage for cattle. Furthermore, aromatic and woody seedlings/saplings are unlikely to be ingested by cattle.</p> <p><b>Fire.</b> No data exists to support the use of prescribed fire to control eucalyptus. However, there is some speculation that prescribed burning prior to cutting trees may assist with herbicide application. In general, eucalyptus infestations are expected to increase the wildfire frequency due to fast growing and highly flammable properties of this species.</p> <p><b>Mechanical.</b> Cutting trees and leaving stumps flat and low to the ground is the common method for control followed by stump grinding or direct herbicide application. Hand pulling of seedlings and saplings up to one inch in diameter is also an effective means of control.</p> <p><b>Chemical.</b> Various herbicides are typically applied to cut stumps. The most commonly used herbicide is 25–50% dilute glyphosphate applied directly to the stump within several minutes of cutting. Because eucalyptus will re-sprout from cut stumps, new growth should be monitored and controlled for up to three years. It has been postulated the best time to remove regrowth is when shoots are 6-8 feet high and are still a major net energy investment for the tree.</p>
Fennel ( <i>Foeniculum vulgare</i> )	<p><b>Grazing Management (None).</b> Grazing management will not control existing fennel infestations in SCTP. Mature fennel is not palatable to livestock and most infestations are located outside of selected grazing management units. However, fennel is not typically found in grazed pastures. Moderate intensity grazing should prevent the establishment of new fennel infestations.</p> <p><b>Fire.</b> Prescribed burning is not a feasible strategy for fennel control in STCP due to proximity to roads and private residences.</p> <p><b>Mechanical.</b> While mowing prior to seed production may prevent further spread of fennel, eradication requires cultivation of plants including full removal of the roots. Although labor intensive, mattocking or hand digging are the preferred strategies for eradication.</p> <p><b>Chemical.</b> Application of 2-4-D while plants are growing but prior to flower production has proven effective. Plants must be wetted</p>

Species	Management Considerations
Milk thistle ( <i>Silybum marianum</i> )	<p>prior to application, particularly the crowns. However, because fennel is often located on embankments adjacent to waterways or impermeable road surfaces, herbicide application may not be feasible.</p> <p><b>Grazing Management (Intensity).</b> Accumulated nitrates in milk thistle leaves are toxic to cattle. Thorny spines on the leaf margins and flower heads will cause selective avoidance by cattle as well. Residual dry matter (litter) in the late summer and fall is a highly important inhibitive factor in the germination of milk thistle seed. Thus, the level of grazing in areas supporting this plant should be carefully managed for appropriate levels of RDM.</p> <p><b>Fire.</b> No data exists to support the use of prescribed fire to control milk thistle infestations. Some observers have noticed a decrease in milk thistle following accidental burns, but this has not been corroborated experimentally. It is generally believed that nutrient loading from fire and lack of competitors will increase milk thistle germination. Prescribed burning may be useful if repeated over 2+ consecutive years.</p> <p><b>Mechanical.</b> Mowing alone is not an effective method of control for milk thistle. Plants are often able to re-sprout and grow back in the same year, or produce viable flower heads below the level of the mower. Tilling or digging prior to flower productions is far more effective in that it removes the entire plant. Plants removed in this manner should be bagged and disposed of offsite because any flowers will still go to seed even after they have been uprooted. Tilled areas should be re-vegetated using a non-invasive, preferably native seed mix to avoid further establishment of milk thistle and other invasive species.</p> <p><b>Herbicides.</b> Spot spray application of 2-4-D, dicamba or picloram during the seedling to rosette phases of milk thistle development has demonstrated effective control. A recent experiment using the herbicides picloram and methabenzthiazuron in combination with phenoxyacetic acid compound was 100% effective in eradicating milk thistle.</p>
<b>Sources:</b>	
Bossard, C.C., J.M. Randall, and M.C. Hoshovsky (Eds.). 2000. Invasive plants of California's wildlands. Berkeley: University of California Press.	
Davy, J.S., J.M. DiTomaso, and E.A. Laca. 2008. Barb goatgrass. University of California Division of Agriculture and Natural Resources, Publication #8315.	
DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and Other Western States. Vols. 1 and 2. University of California Agriculture and Natural Resources, Oakland, CA.	
Lawrence D. Ford Rangeland Management and Conservation Science and EcoSystems West Consulting Group. 2011. Grazing Management Plan, Santa Teresa County Park, San Jose, California. Prepared for Santa Clara County Department of Parks and Recreation.	

**Table 5-21.** Protected Critical Habitat Units

Critical Habitat Unit <sup>1</sup>	Total Critical Habitat in Study Area	Critical Habitat in Open Space Type 1	Percent in Open Space Type 1	Critical Habitat in Open Space Types 2–4	Percent in Open Space Types 2–4	Estimated Critical Habitat in Reserve System <sup>2</sup>	Percent in Reserve System
<b>Bay Checkerspot Butterfly</b>							
5-Metcalf	4,503	780	17%	41	1%	2,580	57%
6-Tulare Hill	348	158	45%	0	0%	169	49%
7-Santa Teresa Hills	3,278		0%	1,699	52%	2,135	65%
8-Calero Reservoir	1,543	2	0%	913	59%	1,336	87%
9a-Kalana	170		0%	0	0%	103	61%
9b-Kalana	56		0%	0	0%	–	0%
10-Hale	507	28	5%	–	0%	434	86%
11-Bear Ranch	283		0%	283	100%	274	97%
12-San Martin	467	241	52%	16	3%	–	0%
13-Kirby	5,446	834	15%	1,244	23%	2,596	48%
<b>Total</b>	<b>16,601</b>	<b>2,042</b>	<b>12%</b>	<b>4,197</b>	<b>25%</b>	<b>9,627</b>	<b>58%</b>
<b>California Tiger Salamander</b>							
East Bay-5	1,393	674	48%	169	12%	549	39%
East Bay-6	3,916		0%	3,757	96%	2,519	64%
East Bay-7	8,595	5,767	67%	–	0%	1,757	20%
East Bay-8	2,536	2	0%	2,357	93%	1,701	67%
East Bay-9	2,935		0%	1,930	66%	190	6%
East Bay-10A	194	0	0%	–	0%	–	0%
East Bay-10B	698	0	0%	–	0%	570	82%
East Bay-11	2,223		0%	1,837	83%	0	0%
East Bay-12	5,607		0%	–	0%	1,436	26%
<b>Total</b>	<b>28,096</b>	<b>6,443</b>	<b>23%</b>	<b>10,049</b>	<b>33%</b>	<b>8,722</b>	<b>31%</b>
<b>California Red-Legged Frog</b>							
ALA-2	1,465		0%	73	5%	819	56%
STC-1	52,283	23,805	46%	12,716	24%	13,573	26%
STC-2	97,214	12,897	13%	9,000	9%	7,344	8%
<b>Total</b>	<b>150,962</b>	<b>36,703</b>	<b>24%</b>	<b>21,789</b>	<b>14%</b>	<b>21,736</b>	<b>14%</b>

<sup>1</sup> Covered species critical habitat within the study area is depicted in **Figure 4-4** (Bay checkerspot butterfly), **Figure 4-5** (California tiger salamander), and **Figure 4-6** (California red-legged frog).

<sup>2</sup> Assumes all land within critical habitat supports primary constituent elements. Includes existing parklands that will be integrated into the Reserve System.



**Conceptual Model  
for  
Conservation Planning\***

**Santa Clara Valley  
Habitat Plan  
Conceptual Approach**

**Metrics  
and  
Tools**

Coarse filter  
conservation



Mesofilter  
conservation



Fine filter  
conservation

Landscape-level  
conservation  
actions



Natural-community  
level conservation  
actions



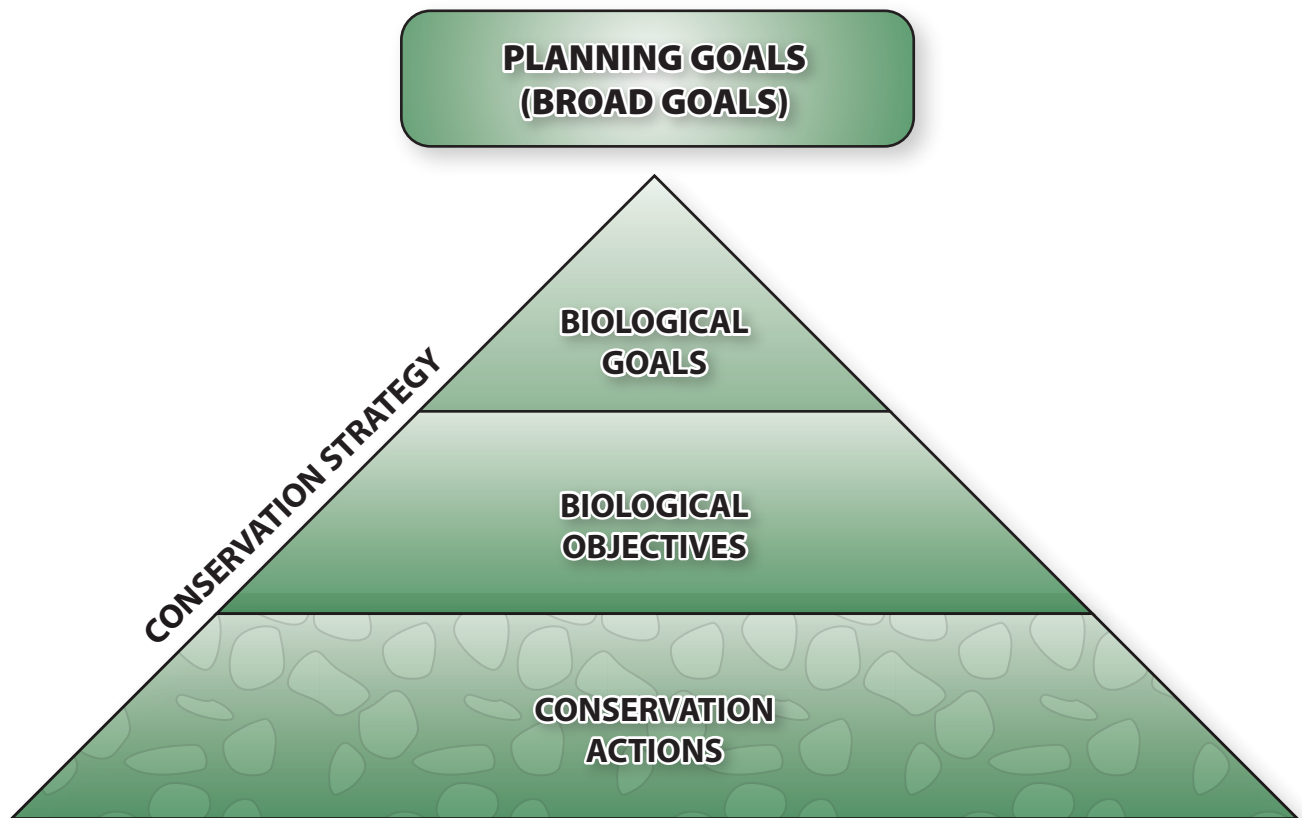
Species-level  
conservation  
actions

- Watersheds
- Topography
- Environmental gradients
- Wildlife linkages

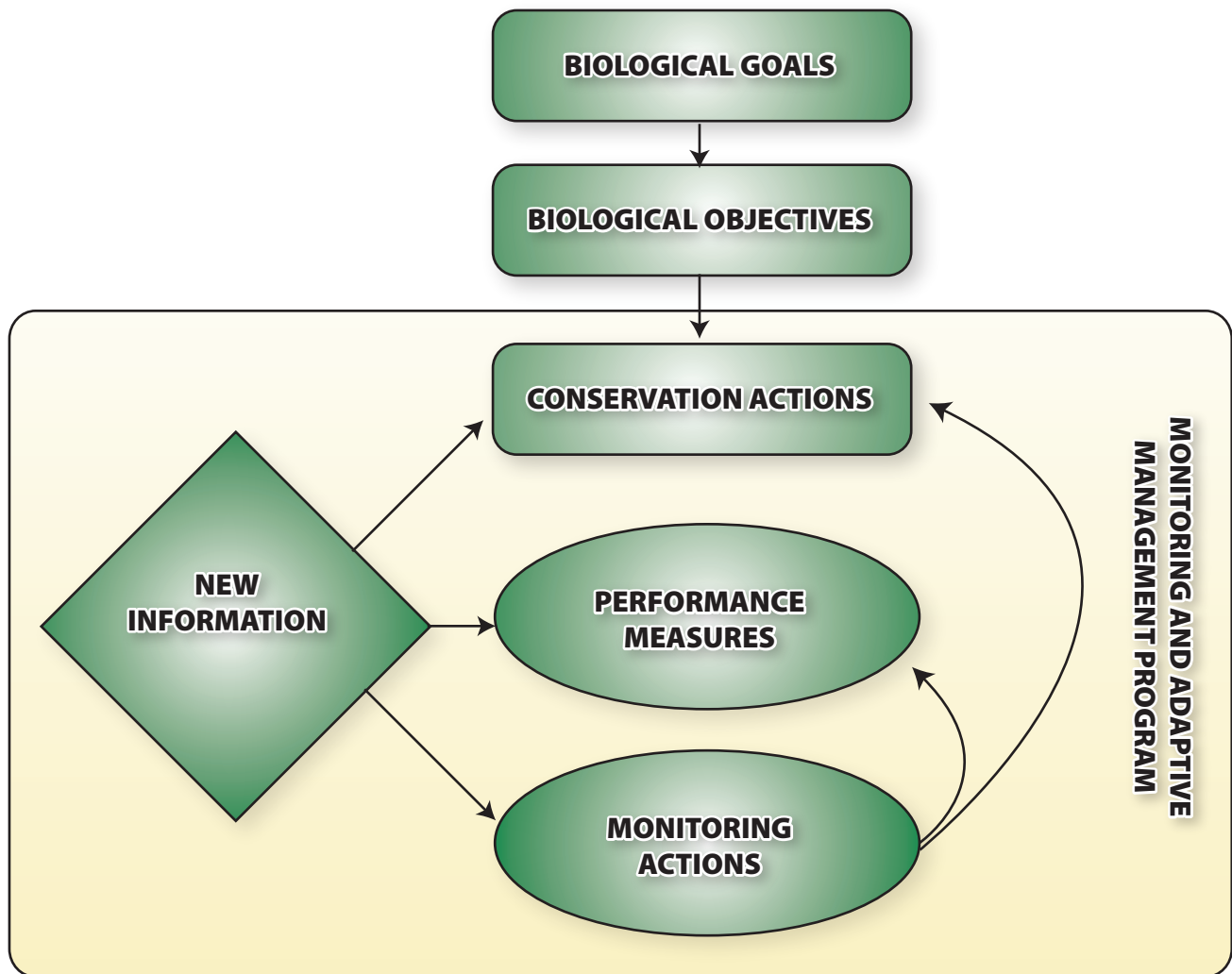
- Natural community types
- Land cover types
- Vegetation associations
- Soil types

- Species range
- Species habitat distribution models
- Species occurrences
- Species populations

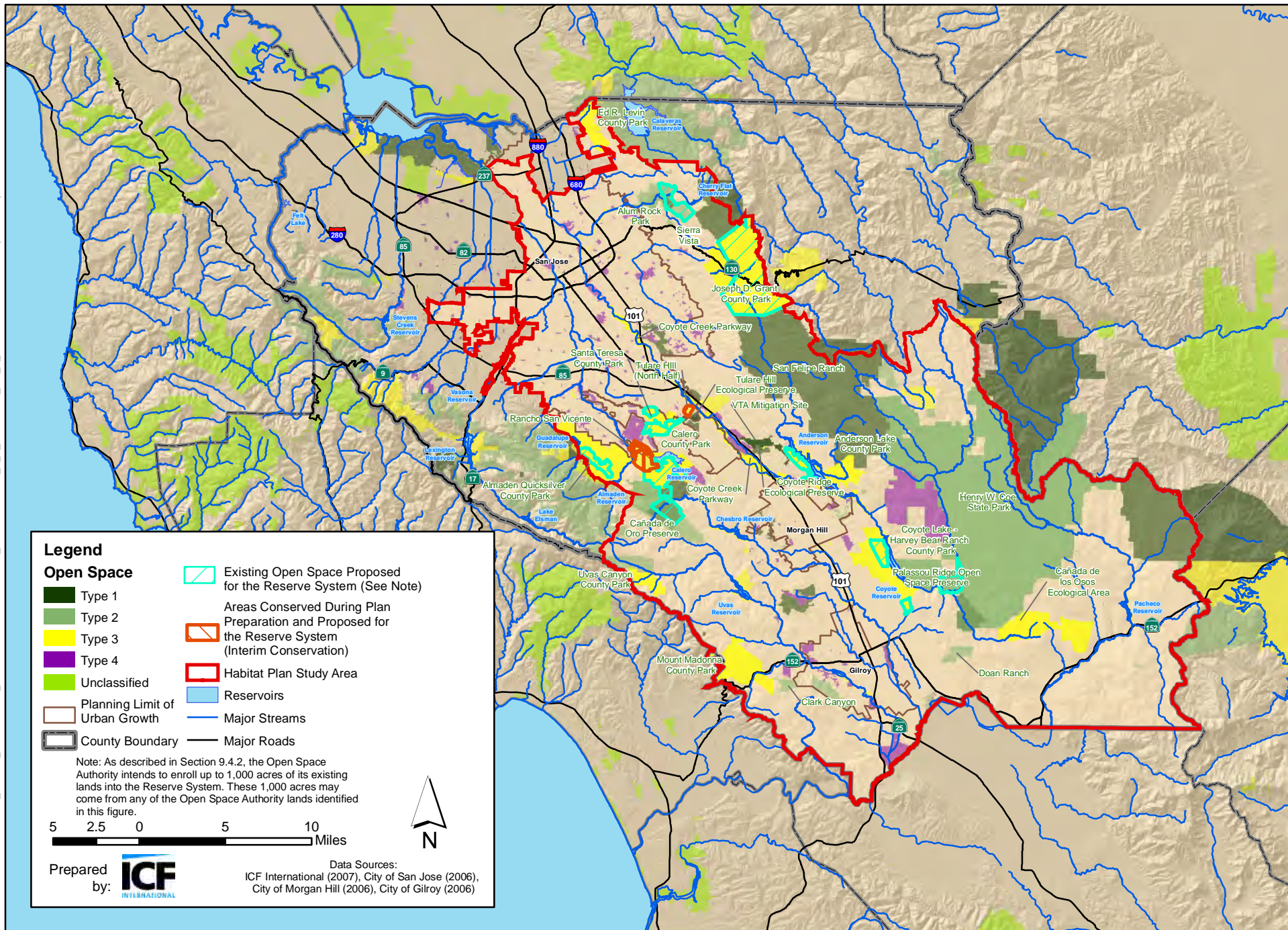
\* Source: Hunter (2005)





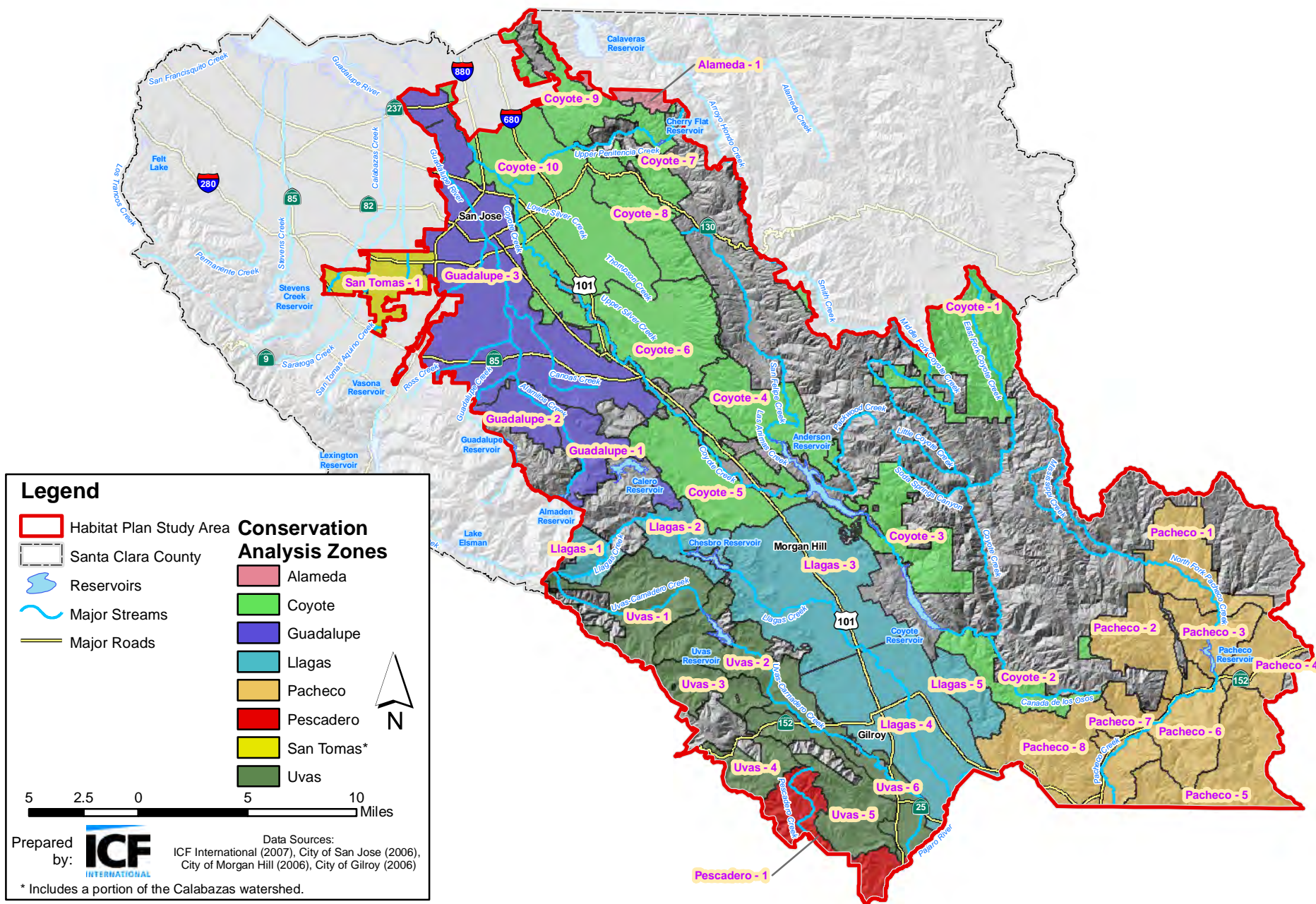


**Figure 5-3**  
**Relationship of Biological Goals and Objectives**  
**to Adaptive Management and Monitoring**



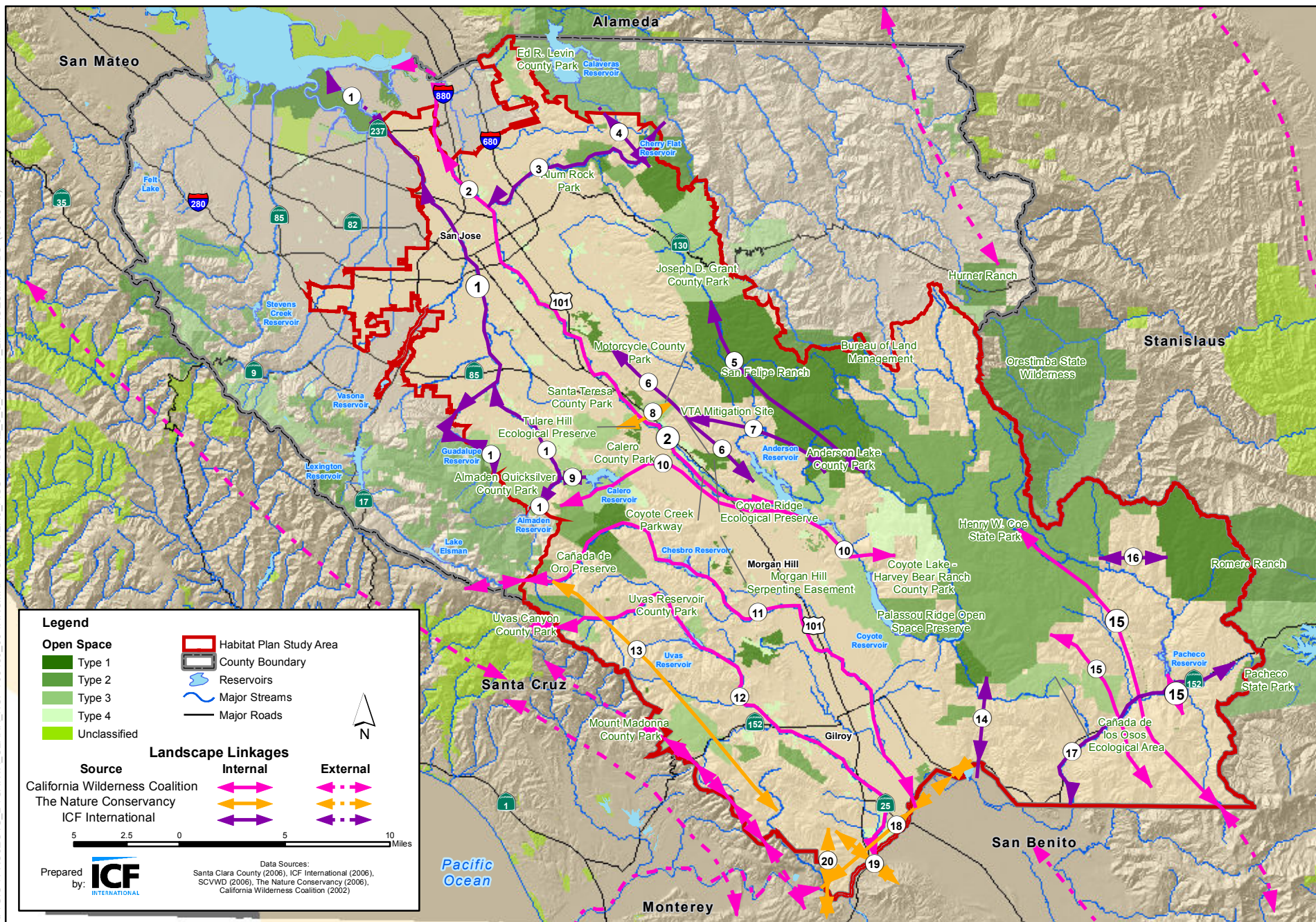
**Figure 5-4**  
**Existing Open Space and Interim Conservation Proposed for the Reserve System**





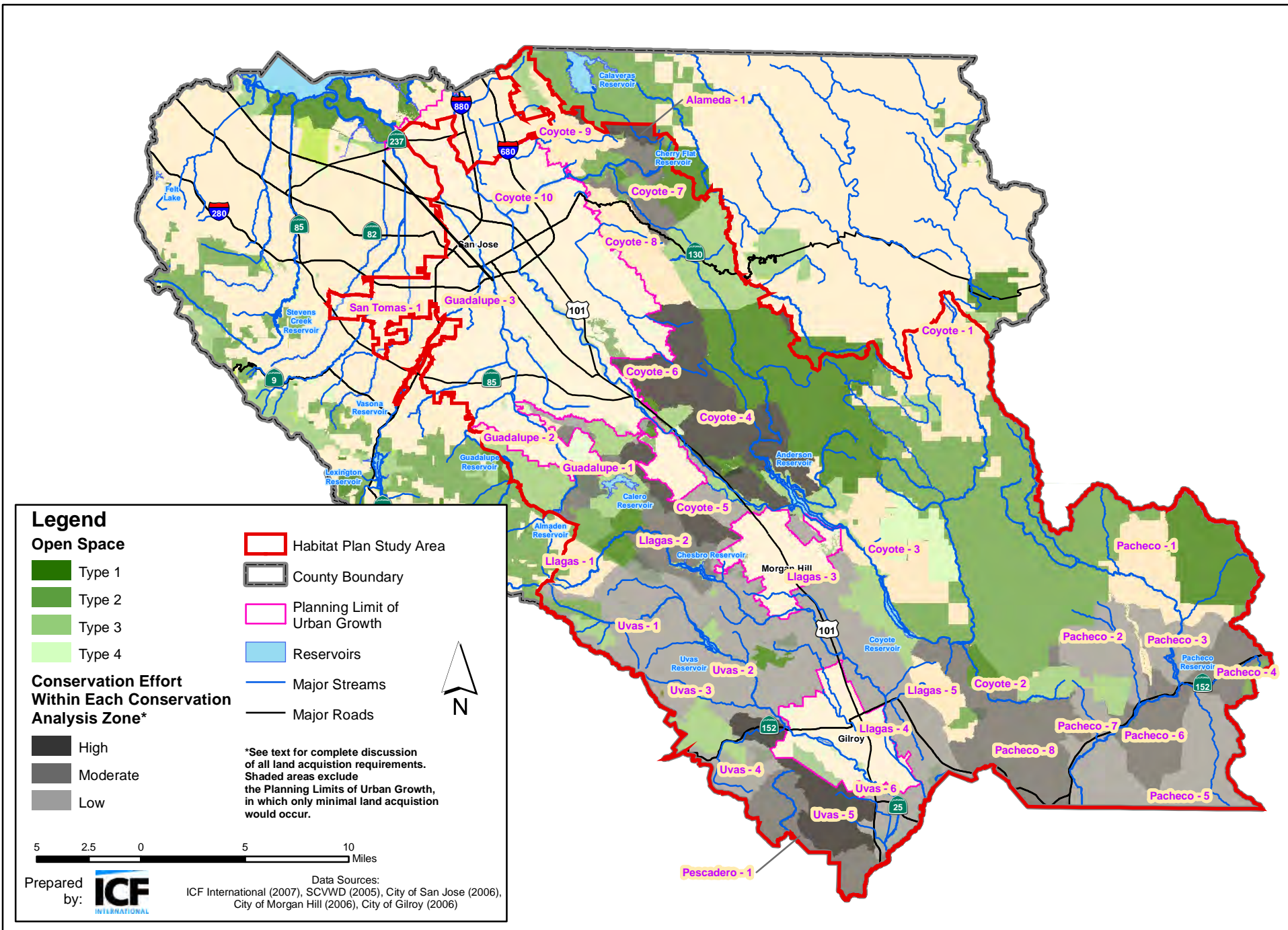
**Figure 5-5**  
**Conservation Analysis Zones**



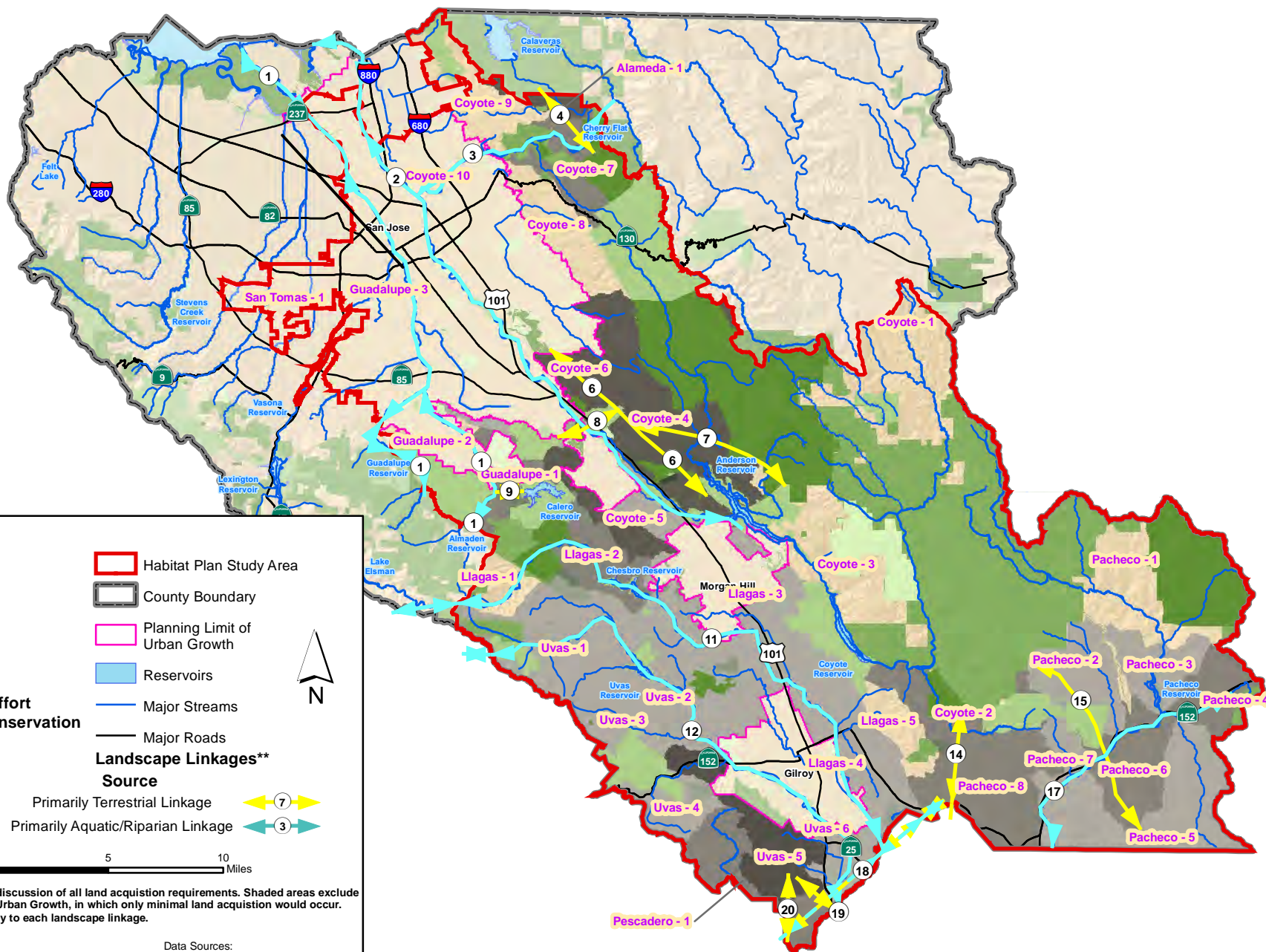


**Figure 5-6**  
**Potential Landscape Linkages in and Near the Study Area**





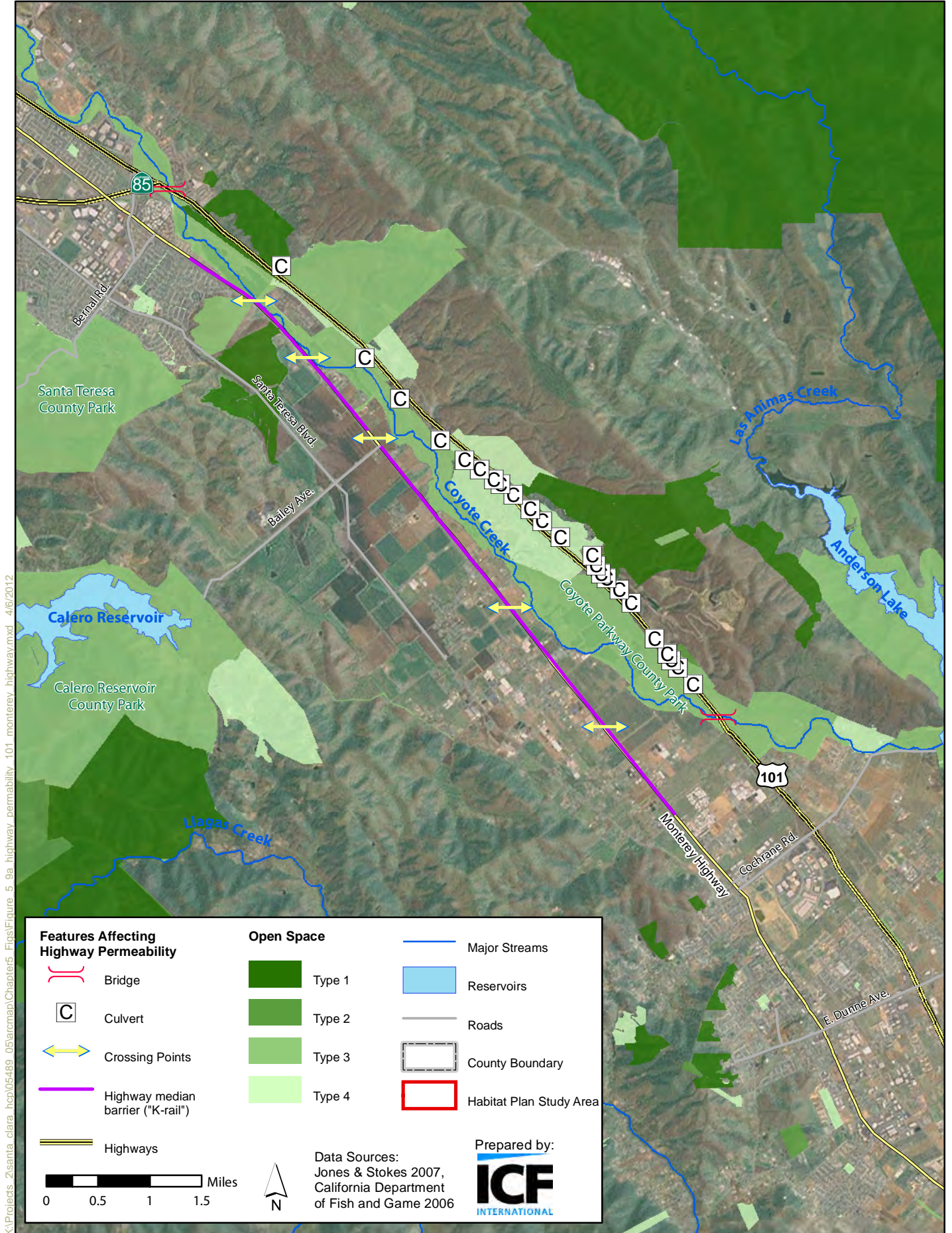
**Figure 5-7**  
**Land Acquisition Strategy**



**Figure 5-8**

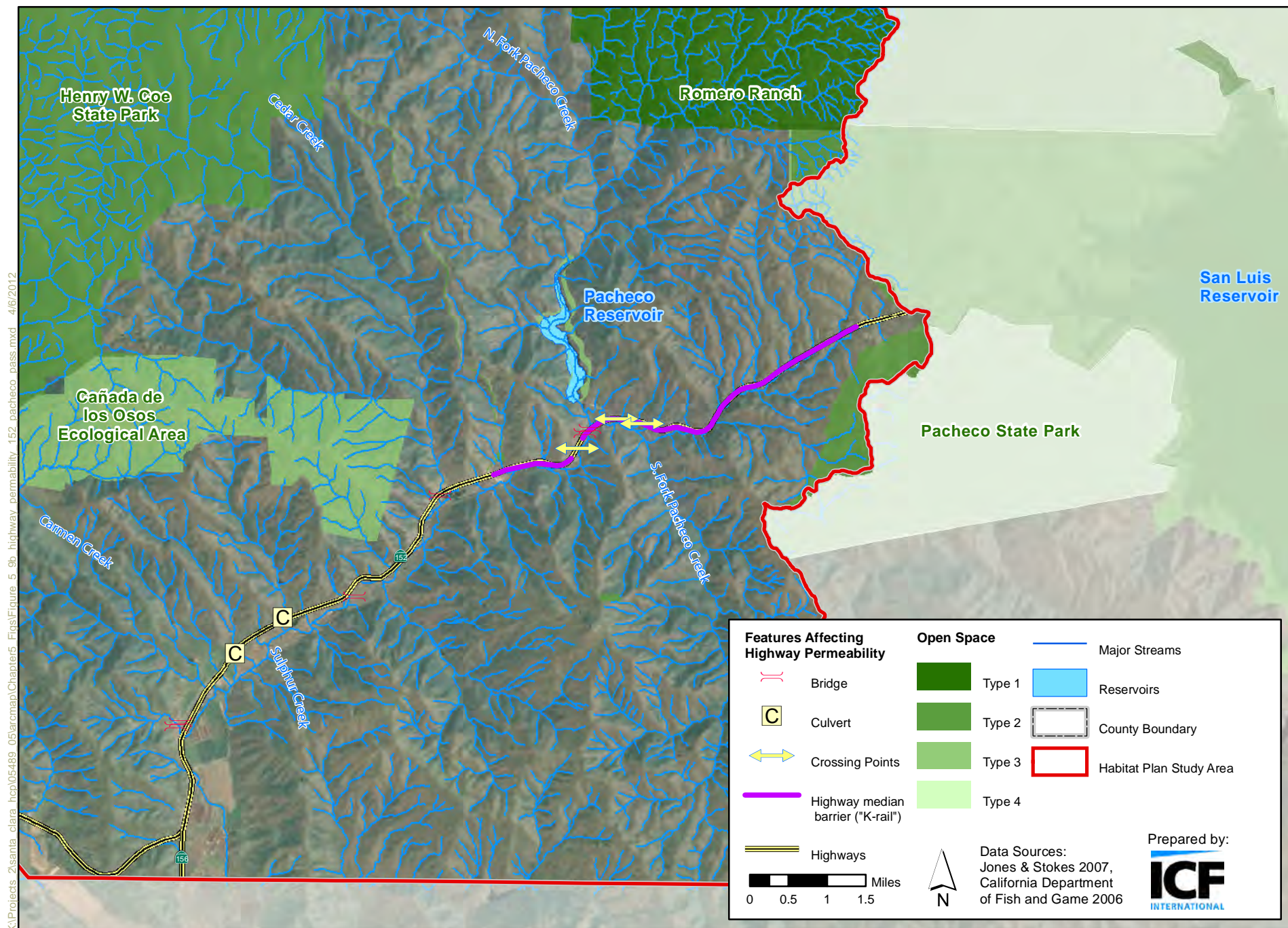
**Land Acquisition Strategy with Applicable Landscape Linkages**





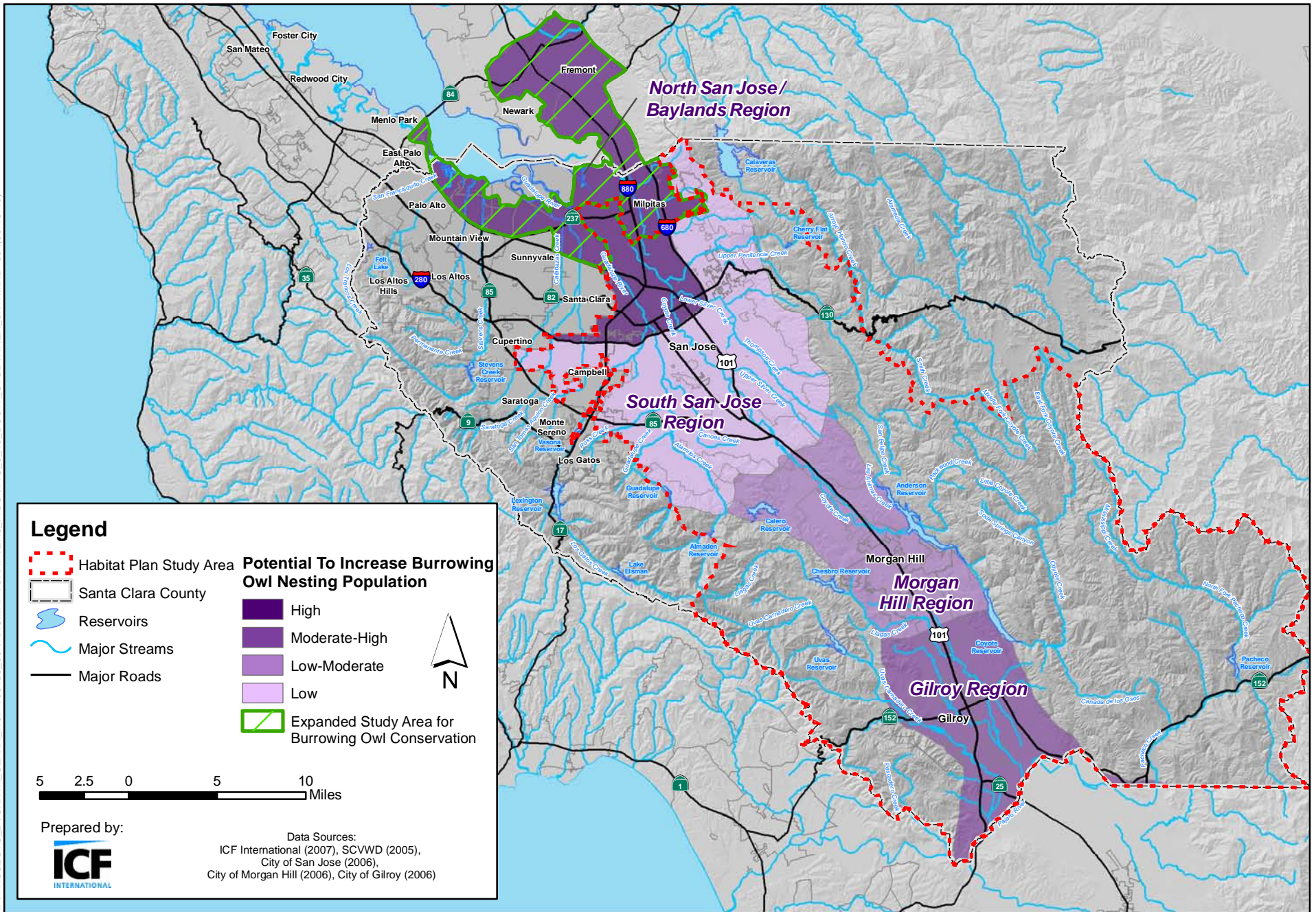
**Figure 5-9a**  
**Permeability along U.S. 101**





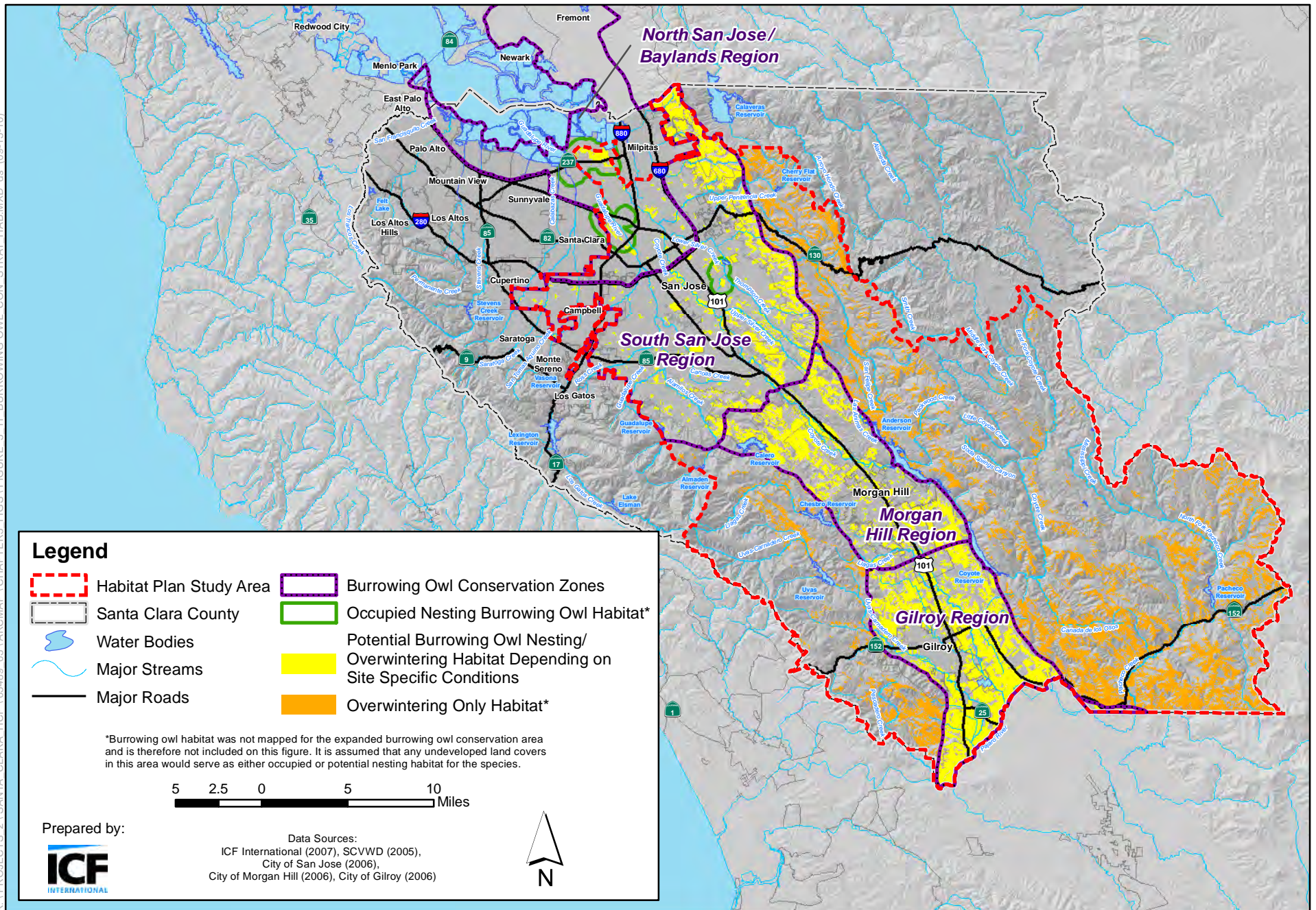
**Figure 5-9b**  
**Permeability along Highway 152**





**Figure 5-10**  
**Expanded Study Area for Burrowing Owl Conservation**





**Figure 5-11**  
**Burrowing Owl Conservation Strategy - Habitat Types**

## Chapter 6

# Conditions on Covered Activities and Application Process

## 6.1 Introduction

As required by ESA (Section 10[a][2][A][ii]) and Fish and Game Code Sections 2820 (a)(6) and 2820(f), this Plan includes measures to avoid and minimize take of covered species. These measures to avoid and minimize impacts are described as *conditions on covered activities* and are designed to achieve the objectives listed below.

- Provide avoidance of covered species during implementation of covered activities throughout the study area.
- Prevent take of individuals from covered activities as prohibited by law (e.g., take of fully protected species).
- Minimize adverse effects on natural communities and covered species where conservation actions will take place.
- Avoid and minimize impacts on jurisdictional wetlands and waters throughout the study area.

In the context of effects on covered species, one of the greatest benefits of an HCP/NCCP is that mitigation for individual projects can be implemented systematically on a regional scale. This enables a more comprehensive approach to conservation that concentrates protection where it has the greatest value. The Plan also restricts covered activities in high-value land cover types (e.g., wetlands, serpentine grassland) and for some species (e.g., covered plants and selected covered wildlife species). By protecting high-quality areas in the Reserve System and restricting covered activities in areas of higher biological value, regional avoidance and minimization goals are supported.

This chapter describes conditions on covered activities that help meet regional avoidance and minimization goals. Regional avoidance and minimization reduces the need for individual projects to avoid and minimize impacts at the project scale and allows streamlining of regulatory requirements. This Plan assumes that take will result from individual covered activities and that this take will be mitigated through the conservation strategy (Chapter 5). Most activities covered under this Plan are required to provide limited documentation of field conditions to verify these assumptions (see Section 6.2 *Exemptions from Conditions*).

Avoidance and minimization measures are regulated by federal, state, and local programs. The conditions on covered activities (avoidance and minimization measures), described in this chapter do not supersede requirements by other agencies and are not intended to provide a basis for non-compliance with other applicable design guidelines required by other federal, state, and local agencies.

This chapter also describes the application process for individual projects to request coverage under this Plan. The application process is described in detail at the end of this chapter in Sections 6.7 *Receiving Take Authorization under the Plan* and 6.8 *Habitat Plan Application Package*. The conditions on covered activities and application process are included in this chapter together so that project proponents have one location in this document in which all requirements are described.

The NCCP Act requires that the Permittees get concurrence from the Wildlife Agencies before adopting, amending, or approving any plan or project that is inconsistent with the objectives and requirements of this Plan<sup>1</sup>. The conditions described in this chapter are designed to ensure this consistency and provide standard and predictable requirements for project applicants. However, Permittees may need to adopt or impose additional conditions beyond those described in this chapter for unanticipated projects or effects in order to ensure consistency with the Habitat Plan and compliance with the NCCP Act. The Permittees will evaluate all projects respective to their authorities to ensure that all applicable conditions described in this chapter have been incorporated into the project prior to extending take coverage under the Plan. Chapter 8 describes applicant responsibilities in the application process.

In addition to the conditions described in this chapter to avoid and minimize impacts, covered activities may also require payment of mitigation fees (see Chapter 9), provision of land in lieu of mitigation fees (see Chapter 8), or habitat restoration or creation in lieu of wetland fees.

## 6.2 Exemptions from Conditions

Many projects within the study area do not disturb the ground or have little or no measurable impact on the covered species or natural communities. Because the probability of take is so low, the need to enforce conditions on the projects and activities specified below would not provide a net benefit for species. Therefore, these covered activities are not subject to the conditions described in this chapter. Quantifiable impacts associated with activities exempt from conditions of the Habitat Plan will be reported in the Application Package (see Section 6.8, below) (impacts that cannot be quantified will not be tracked). Although these covered activities are exempted from the conditions, all of them receive take coverage (**Table 6-1**).

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<sup>1</sup> Fish and Game Code Section 2820(b)(3).

Exemptions based on land cover types are based on the mapping for this Plan at the time of permit issuance and the nature of covered activities previously permitted on the site.

Many of the covered activities exempt from the conditions in this chapter may also be exempt from the Habitat Plan fees, as described in Chapter 9, Section 9.4.1 *Habitat Plan Fees*. The association between covered activities exempt from conditions on covered activities and Habitat Plan fees are shown in **Table 6-1**.

The following activities and projects are exempt from all of the conditions in this chapter and are not tracked as impacts by the Implementing Entity (as described above)<sup>2</sup>.

- Projects that do not result in ground disturbance do not result in release of potential water quality contaminants, or do not create new wildlife barriers.
- Private-sector, routine-maintenance activities that require a development, grading, or building permit, and that occur inside the urban service area (private-sector activities that do not require a development, grading, or building permit are not covered by the Plan or its conditions or fees).
- Private-sector, routine-maintenance activities that require a development, grading, or building permit; that occur outside of the urban service area; and that occur within 50 feet of all existing structures at the time of Plan commencement or within 50 feet of structures that were permitted for incidental take under the Habitat Plan.
- Any covered activity described in Chapter 2 that occurs in urban-suburban, landfill, reservoir<sup>3</sup>, or agriculture developed<sup>4</sup> land cover types as verified in the field, unless the activity may affect a mapped or unmapped stream, riparian, serpentine, pond, or wetland land cover types, or the activity is located in a stream setback (see Condition 11 for a discussion of stream setbacks).
- Routine infrastructure maintenance by public agencies within the planning limit of urban growth that do not affect stream, riparian, serpentine, ponds, or wetland land cover types.
- Routine infrastructure maintenance by public agencies that occurs in urban-suburban, landfill, reservoir, or agriculture developed land cover types that do not affect stream, riparian, serpentine, pond, or wetland land cover types. Examples of such activities include filling pot-holes and resurfacing existing roads without expansion of the paved area.

<sup>2</sup> Project proponents are still required to comply with survey and avoidance requirements for applicable local, state, and federal laws not addressed by the Habitat Plan (e.g., local tree ordinances, state fully protected species, the federal Migratory Bird Treaty Act).

<sup>3</sup> “Reservoir” does not include the dam face. Exemptions described in this chapter do not apply to projects impacting the face of covered dams.

<sup>4</sup> The land cover type “agriculture developed” (also known as agriculture developed/covered ag) is defined in Chapter 3 as intensive agricultural operations such as nurseries and greenhouses.



The following activities<sup>5</sup> are also exempt from all conditions in this chapter but will be tracked by the Implementing Entity as impacts when they occur on natural land cover types.

- Additions to existing structures or new structures that are within 50 feet of an existing structure (e.g., a new garage) that result in less than 5,000 square feet of impervious surface so long as no stream, riparian, wetlands, ponds, or serpentine land cover type are affected. Additions are cumulative and must be calculated based on the footprint of the structure at time of Plan implementation to determine whether this threshold has been crossed.
- A covered activity on a parcel of less than 0.5 acre or less as long as no serpentine, stream, riparian, pond, or wetland land cover type is within the parcel.

A project proponent of a covered activity in the Plan will not be required to comply with the conditions in this chapter or pay any Habitat Plan fees if the proponent of the activity provides written confirmation to the Implementing Entity that the CDFG and USFWS have determined that the activity is not subject to CESA and ESA, respectively; or has already received the necessary take authorizations under CESA and ESA; or has otherwise complied with CESA and ESA. An activity will be deemed to be in compliance with CESA and ESA by the Implementing Entity and thus be exempt from the conditions in this chapter and otherwise comply with the Habitat Plan if the proponent provides the following:

1. Letters from both USFWS and CDFG that specifically refers to the activity and states that the activity is not likely to result in take of any federally or state listed species and will not preclude successful implementation of the conservation strategy for all covered species, or
2. A copy of an incidental take permit issued by CDFG for the activity, and copies of incidental take statements or incidental take permits issued by USFWS that authorize the incidental take associated with the proposed activity.

Additional covered activities are exempt from species surveys, as described in Section 6.8.5 *Item 5: Results of Applicable Species Surveys and Monitoring*, below.

Activities or projects listed in Chapter 2, Section 2.4 *Projects and Activities Not Covered by this Plan*, are specifically excluded from coverage under this Plan and therefore cannot receive take authorization, are not subject to the conditions in this chapter, and do not pay Habitat Plan fees (see Section 2.4 for additional information on these excluded activities and projects). These projects are listed below.

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<sup>5</sup> Although private development that does not meet the criteria described in Section 2.3.2 *Urban Development* subheading *Private Development Coverage Area* and additions of less than 5,000 square feet of new impervious surface (regardless of parcel size) are not subject to the Plan, project proponents may choose to opt into the Plan. If project proponents seek to have these activities covered, the bulleted exemptions apply.

- Private sector activities that do not obtain a development, grading, building, or other construction permit involving land disturbance for the purposes of making land improvements, such as the construction of buildings, roads, and driveways ("building permits" referenced herein do not include plumbing, electrical, or mechanical permits). Activities that do not obtain these development permits are not covered by the Plan.
- SCVWD Stream Maintenance Program activities.
- City of Gilroy expansion beyond the Plan's planning limit of urban growth.
- Bay Area to Central Valley high-speed train.
- New highway between I-5 and U.S. 101.
- Routine and ongoing agricultural activities or expansion of cultivated agriculture into natural land cover types, including vineyard development, that does not seek discretionary approval or permitting by the local jurisdiction.
- Timber harvest operations.
- Quarries and other mining other than expansion of Freeman Quarry (except as otherwise noted).
- New and expanded landfills other than Kirby Canyon, Pacheco Pass Landfill expansions, and landfills occurring inside the planning limit of urban growth of the three cities.
- Mercury removal/remediation (unless described in Chapter 2 as a covered activity).
- Corps led projects.
- Pacheco dam reconstruction and reservoir enlargement.
- Pesticide/ herbicide application for the federal permit.
- Installation and operation of groundwater wells (except as otherwise noted).
- Increased development due to incorporation of San Martin.
- Dam removal and/or construction of new dams.
- Wind farm development.
- Water importation from outside the SCVWD service area.
- Emergency activities.

## 6.3 Conditions on All Covered Activities

The conditions below are categorized and described in several ways: by activity type, by natural community, and by species. Collectively they provide for regional and site-specific avoidance and minimization of impacts on covered species and sensitive land cover types. It is the responsibility of project

proponents to design and implement their projects in compliance with these conditions. For private projects, the applicable local jurisdictions will review project compliance with the conditions in this chapter. The Local Partners will determine best adherence to conditions where discretion exists. If a project applicant proposes to use a less preferable design option (e.g., a culvert instead of a free-span bridge), the project applicant must demonstrate why a preferred option is infeasible. For private applicants, local jurisdictions will determine if this rationale is sufficient under these circumstances.

Conditions on covered activities, including avoidance and minimization measures identified for certain covered activities and species-specific measures, may be revised over the course of the permit term based on results of implementation through the adaptive management process. Proposed revisions will be reviewed by the Wildlife Agencies upon submission of each annual report to ensure the successful implementation of the conservation strategy. Agencies will review and respond within 30 days. Revisions to conditions will be approved by the Wildlife Agencies prior to the Permittees adopting revised conditions. Allowing such revisions will ensure that out-of-date or unsuccessful management techniques do not persist and that best available science can be incorporated into the conditions as appropriate for the Plan.

Compliance with the Habitat Plan does not preclude compliance with all other applicable state and federal laws. It is the project proponent's responsibility to ensure compliance with all applicable laws and regulations.

All projects that discharge dredged or fill material into waters of the United States, including federal jurisdictional wetlands, are required to obtain applicable permits (e.g., Clean Water Act Section 404 and Section 401) from the Corps and the Regional Board. Projects that place fill, alter the bed bank or channel, or divert the flow of streams, alter portions of streams above the ordinary high water mark, alter streams that lack a nexus to navigable waters, wetlands, or lakes under the jurisdiction of the state only are required to obtain a waste discharge requirement from the Regional Board and enter into a streambed alteration agreement with CDFG<sup>6</sup>. Any project that requires a permit from the Corps, Regional Board, or CDFG for impacts on streams and other aquatic areas may be subject to avoidance and minimization requirements. Those requirements may differ from the avoidance and minimization requirements in this Plan.

Condition 1, described below, pertains to all covered activities. Other conditions specifically pertain to certain types of activities, certain species, or certain natural communities and are enumerated in subsequent sections.

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<sup>6</sup> Activities covered by this Plan that need a streambed alteration agreement are expected to fully meet the standards of the streambed alteration agreement through compliance with this Plan for species covered by the Plan.



## Condition 1. Avoid Direct Impacts on Legally Protected Plant and Wildlife Species

### Contra Costa Goldfields

Contra Costa goldfields is a federally endangered and CNPS 1B plant species whose extreme rarity precludes coverage under the Habitat Plan. Because the Habitat Plan does not cover the species, compliance is required on an individual basis.

The likelihood of discovery of new occurrences is very low. If a new occurrence of this species is found, its avoidance would be of the highest importance to the species' viability. If an applicant encounters Contra Costa goldfields on their site, they will contact the USFWS for written concurrence of avoidance to ensure that the project does not jeopardize the continued existence of the species.

### Wildlife Species Protected Under Other Laws

Several wildlife species that occur in the study area are listed as fully protected, as defined under Sections 3511 and 4700 of the California Fish and Game Code. As described in Chapter 1, CDFG cannot issue permits for take<sup>7</sup> of these species. Fully protected species that are known or likely to occur in the study area are listed below.

- Golden eagle.
- Bald eagle.
- American peregrine falcon.
- Southern bald eagle.
- White-tailed kite.
- California condor.
- Ring-tailed cat (= ringtail).

Three of the fully protected raptor species—white-tailed kite, peregrine falcon, and golden eagle—forage widely throughout the study area but nest in discrete locations. Bald eagles are rare winter migrants to Santa Clara County but have been known to breed in the San Francisco Bay Area. A California condor population has been established in San Benito County (Pinnacles National Monument) and birds forage occasionally in Santa Clara County. Additionally, ringtails may be found in some riparian woodlands in the study area.

Further, all migratory bird species and their nests are protected under the Migratory Bird Treaty Act (MBTA). All birds listed above and those covered by

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<sup>7</sup> Take is defined more narrowly in the California Fish and Game Code than in the ESA; see Chapter 1, *Introduction*, for details.

the Plan (western burrowing owl, least Bell's vireo, and tricolored blackbird) are considered migratory birds and subject to the prohibitions of the MBTA. Actions conducted under the Plan must comply with the provisions of the MBTA and avoid killing or possessing covered migratory birds, their young, nests, feathers, or eggs. As described in Chapter 1, the ESA incidental take permit, once issued by USFWS, will automatically function as an MBTA Special Purpose Permit, as specified under 50 CFR Sec. 21.27, for least Bell's vireo (the only migratory bird listed as threatened or endangered under the ESA) for a 3-year term subject to renewal by the Permittees (see Appendix 5 in U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996). Should any other of the covered migratory birds become listed under the ESA during the permit term, the ESA permit would also constitute a Special Purpose Permit under the MBTA for that species for a 3-year term subject to renewal by the Permittees.

Golden eagle and bald eagle are also protected under the Bald and Golden Eagle Protection Act. Take of golden eagle or bald eagle includes "impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment" (72 FR 31133).

## 6.4 Conditions on Specific Covered Activities

Conditions 2–10 pertain to seven specific categories of covered activities: urban development, in-stream capital projects, in-stream operations and maintenance, rural capital projects, rural operations and maintenance, rural residential development, and Plan implementation.

### 6.4.1 Urban Development

Urban development is defined as development occurring inside the urban service area of the three Local Partner cities. Although urban development is assumed in the impact analysis to occur throughout the planning limit of urban growth of each city over the 50-year Habitat Plan permit term, the density of development is not assumed to be urban unless the area is also inside of the urban service area.

There are two conditions on new urban development required by the Plan. Conditions on urban development are limited because of the generally low biological value of resources within urban areas<sup>8</sup>. The two general exceptions are the urban fringe and stream resources. Condition 2 below addresses the edge of new urban development in relationship to the Reserve System; in-stream activities are addressed in subsequent conditions.

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<sup>8</sup> See Chapter 3 for the rationale for this assumption and Chapter 5 for identification of selected sites in urban areas with high-value resources.

## Condition 2. Incorporate Urban-Reserve System Interface Design Requirements

For the purposes of this Plan, the urban-Reserve System interface is defined as the zone between existing and future urban development and the Reserve System. Because the study area includes three cities, development is anticipated adjacent to the Reserve System in some locations. Because of the influence of urban land uses it is anticipated that some areas generally unsuitable for covered species will border some of the Reserves. Urban buildout adjacent to reserves has the potential to directly or indirectly adversely affect covered species and natural communities within the Reserve System. Sources of such adverse effects may include vandalism, dumping of trash, trampling, unauthorized mountain bike or off-road vehicle use; runoff from adjacent streets and landscaped areas containing lawn fertilizer, pesticides, and vehicle waste (petroleum byproducts); introduction of invasive nonnative species (e.g., pampas grass, French broom, Argentine ants, giant reed); lights and noise from nearby development; unregulated movement of domestic animals; and the potential for covered species to enter developed or urban areas.

Beyond minimizing such direct and immediate impacts, the design of the urban-Reserve System interface will consider indirect and long-term effects, such as runoff from developed areas<sup>9</sup> that can transport harmful substances (e.g., pesticides, automotive fluids, sediment) into reserves; establishment of invasive nonnative species that can disperse from nearby landscaped areas; and structural and biological damage (e.g., soil compaction, creation of unauthorized trails, disturbance of sensitive species) that can result from unmanaged human access and use.

The interface design will address the following key questions, which are based on those proposed by Kelly and Rotenberry (1993) for urban reserves in California.

- What external forces or processes may have a negative impact on covered species and habitats at or near the reserve boundary?
- To what extent are those external forces likely to penetrate the boundary and result directly or indirectly in negative impacts on covered species and habitats? (How permeable is the boundary?)
- Which covered species are likely to exit the reserve and expose themselves to increased risk of injury or death?
- What structures can be built or programs implemented to prevent or mitigate these impacts? For example, how can boundary permeability be altered?

With these questions in mind, site-specific interface design requirements were developed to reduce negative impacts of development on covered species and to

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<sup>9</sup> In general, development in the permit area will occur downslope from Habitat Plan reserves, so runoff should flow away from reserves. However, because construction grading often alters local drainage patterns, some runoff could flow into reserves if precautions are not taken.

help reduce conflicts if wildlife moves outside the Reserve System. The following sections (*Design Requirements*) describe requirements and opportunities for reducing impacts on covered species and natural communities on Reserve System lands adjacent to urbanized areas.

## Design Requirements

New urban development that occurs adjacent to reserves or areas with moderate or high priorities for land acquisition (see Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Activities*) will incorporate design requirements at the urban-Reserve System interface to minimize the indirect impacts of development adjacent to existing reserves. The relevant jurisdiction (city or County) will determine which development projects are subject to this condition, as well as which components may be required for a particular development. The Implementing Entity will provide technical assistance when needed. Design requirements to be incorporated in new development at the urban-Reserve System interface, include those listed below.

- Locate the proposed development as far from the reserve boundary as possible consistent with other onsite conditions and constraints.
- Where new development occurs, roads will be placed on the interior of the development (i.e., away from the reserve boundary) to reduce the incidence of domestic pets entering the reserves and to isolate this hazard for wildlife that might enter urban areas from the reserves.
- Fences adjacent to yards or home sites will be designed to minimize the risk of pets escaping private yards and entering reserves (e.g., fences will be as tall as permitted by city and county codes, with no spaces between slats).
- Fences shared with reserve boundaries will not contain any gates between the private property and reserve to prevent entrance and trampling of sensitive species or illegal dumping (legal access to reserves will be provided at recreation staging areas).
- No private gates into the Reserve System will be allowed unless required by a pre-existing access easement and identified as an exception by the Implementing Entity.
- Public roads adjacent to reserves (e.g., a road that is aligned parallel to a reserve boundary) will be fenced to reduce unauthorized public access. Locked gates will be inspected regularly to identify any unauthorized locks.
- Development will be designed to minimize the length of the shared boundary between urban areas and the reserves (i.e., minimize the urban edge).
- Outdoor lighting will be of low intensity and will utilize full cutoff fixtures to reduce light pollution of the surrounding natural areas.
- Use of high-intensity lighting (e.g., recreation facilities, commercial parking lots) near reserves will be avoided or, if necessary, placed as low to the

ground as possible and directed away from the reserves to minimize long-distance glare.

- Public facilities such as ballparks and fields that require high-intensity night lighting (i.e., floodlights) will be sited at least 0.5 mile from the reserve boundary to minimize light pollution. Facilities may be sited closer to the Reserve System if the Implementing Entity determines that the lighting system will not be intrusive to wildlife within the Reserve System (e.g., hills block the lighting).
- For any landscaping, non-invasive plants will be required and use of native plants is highly encouraged, consistent with County landscaping guidelines (County of Santa Clara 2009).
- Natural or artificial barriers or other access restrictions may be installed around development to protect sensitive land cover types and covered species in the reserves. Barriers will be designed so they are appropriate for site conditions and resources protected. Some barriers should keep undesirable pets outside of the Reserve, other barriers should keep covered species inside the Reserve, while others should do both. Before installation of a barrier, consider if the area is used by covered species for movement, if the barrier would prevent movement critical for species life cycle, or if the barrier would encourage species to use other less favorable crossings.

Any design requirements incorporated into projects at the urban-Reserve System interface will be located within the development (i.e., not on the Reserve System) with the exception of the fuel buffer described in Condition 10 below. These features will be maintained by the property owners. The Implementing Entity will monitor compliance with these conditions along the reserve boundary concurrent with other monitoring activities described in Chapter 7. Violations will be reported to the applicable local jurisdiction for enforcement.

Although they are not under obligation or requirement, existing developments located adjacent to reserves or lands identified as land acquisition targets for Plan reserves are encouraged to adopt and implement as many of these design requirements as practicable. Local jurisdictions are encouraged to notify and involve the Implementing Entity during the design review process for large projects planned adjacent to the Reserve System.

In addition to the requirements identified above, several other requirements and avoidance and minimization measures are applicable to development near reserves. Project proponents will comply with the following conditions as appropriate.

- Condition 3. *Maintain Hydrologic Conditions.*
- Condition 7. *Rural Development Design and Construction Requirements.*
- Condition 10. *Fuel Buffer.*

### Condition 3. Maintain Hydrologic Conditions and Protect Water Quality

This condition applies to all projects. The implementation of these projects could result in impacts on watershed health through changes in hydrology and water quality.

Currently, all Permittees have stormwater management plans that regulate new development and redevelopment as part of compliance with regulations under National Pollutant Discharge Elimination System (NPDES) permit requirements. An amendment to the Clean Water Act, the NPDES Program is a compliance permit regulating any point source pollution that is discharged into waters of the United States. The San Francisco Bay Regional Board administers the NPDES program in for the Coyote and Guadalupe watersheds. The Central Coast Regional Board administers the NPDES program for the Pajaro Watershed which includes Uvas, Llagas, and Pacheco subbasins. The purpose of this condition is to identify a consistent approach for applying the most important water quality conditions of each Regional Board across the study area (North and South County).

#### Site Design and Avoidance and Minimization Measures

Through development of stormwater management plans and complementary guidance manuals (Santa Clara Valley Urban Runoff Pollution Prevention Program 2006; City of Gilroy 2004; City of Morgan Hill 2004, 2008; Santa Clara Valley Water Resources Protection Collaborative 2006; Santa Clara Valley Water District 2008), the Permittees have identified a set of programmatic avoidance and minimization measures, performance standards, and control measures to minimize increases of peak discharge of stormwater and to reduce runoff of pollutants to protect water quality including during project construction. These avoidance and minimization measures originated, in part, from the measures that area typically required by the Regional Boards and CDFG for projects that have the potential to affect aquatic resources. Many of these avoidance and minimization measures also support the biological goals and objectives of this Habitat Plan. Implementation of these avoidance and minimization measures will reduce the potential for adverse impacts on covered species. **Table 6-2** lists avoidance and minimization measures for all water-related covered activities described in Condition 3, 4, and 5 of this Plan. Each local jurisdiction, or the Implementing Entity in the case of projects conducted by the Permittees, will verify that all appropriate measures in **Table 6-2** are implemented to minimize effects to covered species and their aquatic habitat (see Section 6.8.6). **Table 6-2** lists the source control measures and avoidance and minimization measures from the Permittees' existing stormwater management plans and complementary manuals that are most effective in protecting covered aquatic species and aquatic species habitat.

The requirements listed in **Table 6-2** include general, project design, construction, and post-construction avoidance and minimization measures. Project design measures are site design planning approaches that protect water quality by preventing and reducing the adverse impacts of stormwater pollutants and increases in peak runoff rate and volume. They include hydrologic source control measures that focus on the protection of natural resources and the reduction of impervious surfaces. Construction site conditions include source and treatment control measure to prevent pollutants from leaving the construction site and minimizing site erosion and local stream sedimentation during construction. Post-construction conditions include measures for municipal operations, stormwater treatment, and flow control.

In addition to the avoidance and minimization measures identified above, several other avoidance and minimization measures are identified in other conditions that will help reduce potential impacts to water quality in the study area. Project proponents will comply with the following conditions as appropriate.

- Condition 2. *Incorporate Urban Reserve System Interface Design Requirements.*
- Condition 4. *Stream Avoidance and Minimization for In-Stream Projects.*
- Condition 5. *Avoidance and Minimization Measures for In-Stream Operations and Maintenance.*
- Condition 7. *Rural Development Design and Construction Requirements.*
- Condition 8. *Implement Avoidance and Minimization Measures for Rural Road Operations and Maintenance.*
- Condition 11. *Stream and Riparian Setbacks.*
- Condition 12. *Wetland and Pond Avoidance and Minimization.*

## 6.4.2 In-Stream Projects

In-stream projects—such as flood protection projects, construction of new bridges and repair or rehabilitation of existing bridges or culverts, and water supply capital projects—have the capacity to affect wildlife, aquatic species, and habitats by introducing sediment discharge, disturbing earth and riparian vegetation, and altering hydrologic and hydraulic characteristics of water bodies. Condition 4 is designed to address such impacts.

Several of the in-stream covered activities described in Chapter 2 are also covered activities under the SCVWD proposed Three Creeks HCP. The conditions described below for in-stream projects, as well as for stream and riparian habitat and associated covered species (e.g., Condition 16), are consistent with the Three Creeks HCP.

## Condition 4. Avoidance and Minimization for In-Stream Projects

The primary purpose of this condition is to identify design requirements and construction practices for in-stream projects to minimize impacts on riparian and aquatic habitat. The term *in-stream* is defined for the purposes of this Plan as the stream bed and bank and the adjacent riparian corridor. The adjacent riparian corridor encompasses all mapped riparian land cover (i.e., riparian forest and scrub natural community) immediately adjacent to a stream (see **Figure 3-10** for mapped land cover types). All in-stream projects must be designed to minimize adverse impacts on stream morphology, aquatic and riparian habitat, and flow conditions. Projects that may also affect wetlands or pond areas are addressed in Condition 12, *Wetland and Pond Avoidance and Minimization*.

All in-stream projects, including projects occurring in dewatered reservoirs, will adopt design requirement and construction avoidance and minimization measures to minimize impacts on covered species, natural communities, and wildlife movement. SCVWD and other Local Partners, such as County Parks, have developed avoidance and minimization measures for projects occurring in streams. The Fishery Network of Central California Coastal Counties (called “FishNet 4C” for the original four counties involved) developed the *County Road Maintenance Guidelines for Protecting Aquatic Habitat and Salmon Fisheries* (Fishery Network of Central California Coastal Counties 2004). This manual, while focused on road maintenance activities, provides avoidance and minimization measures that are applicable to all types of in-stream construction activities. **Table 6-2** summarizes these collected avoidance and minimization measures that are required conditions of in-stream covered activities. Avoidance and minimization measures in this table are applicable to the covered activities addressed in this condition as well as in Condition 3, *Maintain Hydrologic Conditions and Protect Water Quality* and Condition 5, *Avoidance and Minimization Measures for In-Stream Operations and Maintenance*. The avoidance and minimization measures address construction staging, dewatering, sediment management, vegetation management, bank protection, drainage, trail construction, and ground disturbance.

All avoidance and minimization measures listed in **Table 6-2** are required unless the avoidance and minimization measure is not appropriate for the activity or field data collected at the site or in comparable areas demonstrate that the avoidance and minimization measure would not benefit wildlife or reduce impacts on natural communities. The Implementing Entity will update the avoidance and minimization measures in **Table 6-2** over time so that they are more appropriate for implementing a specific covered activity or more beneficial for the covered species. Therefore, the Implementing Entity will update this list of avoidance and minimization measures over the permit term as appropriate to reflect new science and avoidance and minimization measure monitoring results. Proposed revisions will be reviewed by the Wildlife Agencies upon submission of each annual report to ensure the successful implementation of the conservation strategy. **Table 6-2** also includes additional avoidance and minimization measures drawn from those currently used by the Local Partners that strive to



reflect current and forthcoming regulations and guidelines for in-stream project design (e.g., the State Water Board's *Wetland and Riparian Area Protection Policy*, described below).

## Types of Projects Subject to Condition

The in-stream projects listed below are subject to the design requirements or construction practices because they are expected to result in impacts on creeks or streams.

- Installation or rehabilitation of flood protection projects and levee reconstruction.
- Bank stabilization projects.
- Geomorphic rehabilitation.
- Gravel enhancement.
- Bridge construction and replacement including vehicular, train, and pedestrian bridges throughout the study area.
- Development of trails in or through the in-stream area (stream bed, banks, and adjacent riparian land cover).
- Culvert installation or replacement.
- Dam repair and seismic retrofit, including dewatering events and development of borrow sites.
- Restoration projects throughout the study area, including creek realignment and erosion management.
- Operation, maintenance and replacement of existing water supply structures such as stream gauges, percolation ponds, and diversions.
- Any other activity that requires construction work within the in-stream area (stream bed, banks, and adjacent riparian land cover).

## Design Requirements

Some impacts on stream and riparian land cover types are expected under the Plan (see **Tables 4-2 and 4-3**). All covered activities subject to this condition will implement the measures listed in **Table 6-2** associated with this condition to avoid or minimize impacts of covered activities on streams and riparian woodland/scrub.

- Applicants must also comply with Condition 7 *Rural Development Design and Construction Requirements* where applicable.
- Applicants for projects with streams on site must follow the setback requirements in Condition 11, *Stream and Riparian Setbacks*.

- Applicants for projects with wetlands or ponds on site must comply with Condition 12, *Wetland and Pond Avoidance and Minimization*.
- Applicants for transportation improvements that include stream crossings must comply with Condition 6, *Design Requirements for Covered Transportation Projects*.

### **Design Criteria for SCVWD Flood Protection Projects**

Flood protection projects shall be designed with an objective to protect or enhance natural channel and habitat functions. Designs will be developed and selected to maintain or improve bank stability, minimize bed degradation or aggradation, protect or improve streambed substrate conditions, protect or increase habitat diversity and complexity, and minimize required maintenance. All covered flood control projects will incorporate the following design elements:

1. Flood protection projects will incorporate support for natural stream functions and allow for natural stream processes to occur consistent with the flood protection goals of the project. Approaches for flood protection will generally include excavation of flood benches based on natural geomorphic conditions, off-stream detention, set-back levees or floodwalls, biotechnical bank stabilization methods, and grade control.
2. Project design alternatives will consider habitat connectivity between the stream and the adjacent floodplain as an objective.
3. Project design alternatives will incorporate native riparian vegetation and in-stream habitat enhancement features, where feasible. Potential enhancement features will be evaluated during the project design review process described below.
4. Bypasses that convey all or a portion of flood flows into channels, tunnels, culverts, or other areas that are isolated from the natural stream will be used only when other options have been evaluated and found infeasible to meet flood protection goals. If used, bypasses will be designed considering local geomorphic and flood characteristics and will minimize impacts to in-stream habitat.

### **Review Process for Covered Flood Control and Levee Reconstruction Projects**

1. Flood control and levee reconstruction projects shall be reviewed by the Wildlife Agencies as described in Chapter 8, Section 8.7.3 *Wildlife Agency Responsibilities*.
2. During the 60% project design stage(s), review and input from the Wildlife Agencies shall be solicited.
3. The Wildlife Agencies providing review will return comments within a mutually agreeable timeline to maintain project schedule. As described in Chapter 8, Section 8.7.3 *Wildlife Agency Responsibilities*, the Wildlife Agencies must review and approve flood control projects to ensure that they are consistent with Habitat Plan requirements.

### Requirements for SCVWD Dewatering Events

The following conditions apply to the dewatering events conducted at SCVWD covered reservoirs. Dewatering events *are necessary* for seismic safety retrofit and major maintenance (see Chapter 2 for a description of these covered activities). Due to the unique characteristics at each dam site, a reservoir-specific dewatering plan will be submitted to the Wildlife Agencies for review and approval prior to the first dewatering event for each reservoir (see Chapter 8, Section 8.7.3 *Wildlife Agency Responsibilities* for details of this process). Dewatering plans will be reviewed and, if appropriate, updated prior to subsequent dewatering events during the permit term. Dewatering plans will address various issues as requested by the Wildlife Agencies during the covered activity review process or as required by the environmental compliance process and will include the following.

- Timing for the initiation and duration of the dewatering event, including the draining and refilling stages of the dewatering event.
- Average, minimum, and maximum flows expected during draining and refilling (flows will be within the limits described in **Table 2-4**) including the duration of periods in which the maximum reservoir release may be made.
- A schedule for re-operation according to applicable rules curves.
- The ability of SCVWD to bypass water or provide other supplemental sources downstream.
- Documentation of in-channel dryback conditions from the previous 3 years, if feasible, and an evaluation of potential increases in the length and duration of dryback related to the dewatering event.
- A qualitative assessment of total flows that could occur downstream of the dam when taking into account stream inflows other than reservoir releases (e.g., stormwater, urban runoff) based on monitoring done during the previous years to assess the level of potential dryback.
- A description of baseline monitoring conducted for California red-legged frog, foothill yellow-legged frog, and western pond turtle in channels to be affected by the drawdown to establish presence of covered species in the channel.
- A description of anticipated effects of the dewatering event on covered species.

In addition, minimization measures included in a dewatering plan could include, but are not limited to, the following.

- Releases will not result in the overtopping of the channel between May and July when western pond turtles are nesting.
- SCVWD will bypass reservoir inflow around the dam and/or provide other supplemental flows downstream of the reservoir.
- SCVWD will consider installing outlets that provide better control over release volumes (beneficial for subsequent dewaterings).

- SCVWD will ramp increases and decreases in flows during dewatering to avoid washing covered species downstream or drying back the channel faster than covered species can adapt and move to new locations.
- Surveys for covered species as required by this chapter prior to re-filling of the reservoir or other construction activities if the reservoir basin has been undisturbed for a period of time. Surveys may be limited to areas that were not disturbed during construction or that were not inundated before construction but may be after construction.
- As reservoir levels decline, the gravel trap at the upstream end of the reservoir, if present, will be isolated and lined to contain inflow to provide for a relocation site for rescued native fish, amphibians, and/or western pond turtle.
- The lined gravel traps will be designed to allow bypass of inflow through or around the reservoir.

### 6.4.3 In-Stream Operations and Maintenance

In-stream<sup>10</sup> operations and maintenance activities covered under this Plan—such as sediment removal, bank stabilization, vegetation management, and debris blockage removal to maintain flows—have the potential to affect covered species by introducing sediment and other pollutants into downstream waterways or by disturbing riparian land cover associated with streams. Condition 5 specifies avoidance and minimization measures for covered operations and maintenance activities within and immediately adjacent to the stream channel. Note that SCVWD’s Stream Maintenance Program is not a covered activity under this Plan and therefore not subject to the conditions of this chapter of the Plan.

## Condition 5. Avoidance and Minimization Measures for In-Stream Operations and Maintenance

The purpose of this condition is to identify avoidance and minimization measures to be applied when conducting in-stream operations and maintenance activities. The measures will help reduce impacts on stream and riparian land cover types and covered species.

### Types of Projects Subject to Condition

The following in-stream operations and maintenance activities are subject to the measures or construction practices described below because they are expected to result in impacts on creeks or streams.

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<sup>10</sup> *In-stream* is defined for the purposes of the Plan as, “the stream bed and bank and the adjacent riparian corridor.”

- Facility maintenance such as trail, bridge, road, and culvert repair and/or replacement in in-stream areas.
- Natural resource protection such as small bank stabilization projects and removal of debris deposited during flooding.
- Operations and maintenance of flood protection facilities (e.g., dams, armored creeks, detention ponds, streams). Activities may include vegetation management, minor sediment removal, or bank stabilization.
- Operations and maintenance of water supply facilities (e.g., flashboard dams, inflatable dams, stream gages, pipelines, and diversions).
- Non-routine stream maintenance activities conducted by SCVWD (i.e., those activities not covered by SCVWD's Stream Maintenance Program) including extensive removal of vegetation in the Lower Llagas flood control channel.
- Removal of debris blockages except in emergency situations.
- Mitigation and/or monitoring in creeks or adjacent riparian corridors.
- Vegetation management for exotic species removal, such as removal of giant reed, and native vegetation plantings.
- Reservoir dewatering events.
- Reservoir filling.

Avoidance and minimization measures listed in **Table 6-2** will apply to all streams in the project areas as well as to open canals, because these canals may provide habitat for covered species.

## Stream Operation and Maintenance Activities

Several of SCVWD's Stream Maintenance Program avoidance and minimization measures were adapted for inclusion in **Table 6-2** and will be adopted for this Plan. Additional avoidance and minimization measures are identified below to ensure adequate avoidance and minimization of species covered under this Plan during implementation of stream operations and maintenance covered activities. These avoidance and minimization measures were informed by sources that include the Santa Clara Valley Resources Protection Collaborative *Guidelines and Standards* (Santa Clara Valley Water Resources Protection Collaborative 2006) and the SCVWD *Best Management Practices Handbook* (Santa Clara Valley Water District 2008). Throughout the permit term, avoidance and minimization measures listed in **Table 6-2** will be updated through the adaptive management process to reflect current best practices.

## Dam Maintenance Program

All applicable measures in **Table 6-2** will apply to implementation of activities associated with the Dam Maintenance Program (see Chapter 2). In addition,

activities requiring reservoir dewatering will comply with the requirements for dewatering reservoirs described above under Condition 4 *Stream Avoidance and Minimization for In-Stream Projects* and in Chapter 2.

## Pipeline Maintenance Program

While SCVWD's Pipeline Maintenance Program is described in Chapter 2 under Section 2.3.6 *Rural Operations and Maintenance*, some activities have the potential to affect aquatic resources, particularly at blow-off sites. The following avoidance and minimization measures are from SCVWD's Pipeline Maintenance Program Final Program EIR (MHA Environmental Consulting 2007) and will be applied to Pipeline Maintenance Program covered activities in addition to other applicable avoidance measures described in this chapter.

- The discharge location and receiving water will be observed for signs of erosion by a trained individual. If erosion is evident, flow rates will be reduced. If erosion continues to occur, discharges will be terminated until appropriate erosion control measures are installed. Monitoring will be conducted just prior to the start of the discharge and regularly (i.e., every hour, every four hours, every eight hours) during the discharge. Monitoring frequency will depend on the nature of the discharge and the erosion in the area.
- An environmental monitor will walk along each discharge drainage to the termination of the drainage or 500 feet downstream to inspect for erosion after a draining is complete. If erosion is detected, reclamation measures will be taken to correct the erosion. Correction measures shall include recontouring the land to its previous state and revegetating with the appropriate native grass species in the area, if necessary.
- Discharge rates will be ramped up slowly such that the increase in flow rate in the receiving water is gradual and scouring of the channel bed and banks does not occur.
- Flows will be diverted around sensitive, actively eroding, or extremely steep areas to prevent erosion. Flow diversion methods might include use of flexible piping and/or placement of sandbags to alter flow direction, or equivalent measures. The new flow path and discharge point will be monitored for signs of erosion.
- Pipeline discharge for maintenance work would preferentially be performed during winter months, when storm events are more common and when water is naturally highest. Discharge flows are then a minimal portion of overall stream or river flow. If draining must occur during summer or fall, a slow release is mandatory to ensure receiving waters do not experience a substantial temperature change (greater than 2 degrees Fahrenheit).

## 6.4.4 Rural Projects

Rural projects include transportation projects, the South County Airport expansion, the Kirby Landfill expansion, construction of large new recreation facilities (e.g., golf course, sports fields, and extensive picnic areas), capital water supply projects, and private rural residential and commercial development. These rural projects have the potential to affect covered species by removing substantial areas of habitat, disrupting hydrologic patterns, contributing to habitat fragmentation, discharging sediment into water bodies, and resulting in direct mortality of covered species. Conditions 6 and 7 are designed to reduce the severity of such impacts for rural projects.

### Condition 6. Design and Construction Requirements for Covered Transportation Projects

This condition identifies design requirements to minimize the impacts of transportation projects on wildlife movement, occurrences of certain covered species, and important habitat for covered species. All road and rail transportation projects (including the BART extension), or portions thereof, outside streams and within the planning limit of urban growth are exempt from this condition. Road projects in these areas are either within participating cities (i.e., urban areas) or within adjacent County jurisdiction, both of which support relatively dense suburban development. Road projects in these areas are not expected to significantly affect wildlife linkages, occurrences of covered species, or habitat for covered species. All covered transportation projects that cross streams or creeks, including bridges, are subject to Condition 4 above.

Four new road extensions/connections/realignments are proposed outside the planning limit of urban growth during the permit term of this Plan. However, many road improvements, including road widenings, are covered by the Plan (see **Table 2-6**). One new mass transit project is covered by the Plan: the double tracking of the Caltrain line from San José to Gilroy along the existing corridor.

#### Exempt Transportation Projects

The following projects are not subject to the design requirements or construction practices specified in this condition because they are not expected to result in new ground disturbance and are not expected to create new wildlife movement barriers or augment existing barriers.

- Installing traffic signals, signs, pavement markings, flashing beacons, or other safety warnings.
- Painting new lane striping.
- Installing “rumble” strips, channelizers, or other safety markers.
- Installing guardrails or similar structures that are permeable to wildlife.

- Installing ramp metering.
- Regrading existing shoulders (this activity is considered maintenance; see Condition 8).
- Implementing other road safety improvements on less than 1,000 feet of roadway.

All transportation projects that cross creeks are subject to Condition 4 above.

The following projects are also exempt from this condition, due to their small footprint, if the project does not include installation of median barriers or other impermeable safety barriers, and if no mapped or unmapped stream, riparian, serpentine, pond, or wetland land cover types are present, and if the activity is not located in a stream setback. Project lengths must be calculated based on the all new adjacent projects constructed since the time of Plan implementation to determine whether the below thresholds have been crossed.

- Widening roads to add lanes where the project is less than or equal to 1,000 feet in length.
- Realigning roads for safety or operational purposes where the project is less than or equal to 1,000 feet in length.
- Constructing new turn lanes less than or equal to 1,000 feet in length.
- Constructing a new road shoulder less than or equal to 1,000 feet in length.

Outside the planning limit of urban growth transportation projects will adopt design requirements and construction practices to minimize impacts on covered species, natural communities, and wildlife movement (see below). Depending on the type of project, these design requirements and construction practices would be *required* or *possible* (**Table 6-3**).

- **Required (R).** Design element or construction practice is required.
- **Possible (P).** Design element or construction practice is required unless field data collected at the site or in comparable areas demonstrate that the element or practice would not benefit wildlife, and CDFG and USFWS concur with the findings.

## Types of Projects Subject to Condition

The following projects are subject to the design requirements or construction practices because they are expected to result in new ground disturbance, or they may create new wildlife movement barriers or augment existing barriers. Each project category is subject to a specific combination of requirements listed below and in **Table 6-3**.

### Highway Projects

Highway projects are those VTA projects identified in **Table 2-6** as highway projects that call for the expansion of existing highways within the study area.



### **Mass Transit Projects**

The single mass transit project identified for coverage in this Plan is the VTA project identified in **Table 2-6** as *Caltrain South County* which calls for the double tracking of the existing Caltrain corridor.

### **Roadway Projects and Interchange Upgrades**

Major roadway projects and interchange upgrade projects (major roadway projects) are those projects identified in **Table 2-6**. All non-exempt Santa Clara County roadway projects and VTA interchange upgrades identified in **Table 2-6** are subject to the conditions identified **Table 6-3**.

### **Road Safety and Operational Improvements**

These projects include the road projects described in Section 2.3.5 *Rural Capital Projects* that are not listed in **Table 2-6**. Road safety and operational improvements are expected to involve ground-disturbing activities but are not expected to impede or substantially worsen wildlife linkage. However, there may be opportunities for some projects to improve wildlife linkages. These projects are subject to construction and post-construction practices but not to project design requirements (**Table 6-3**).

### **Dirt Road Construction**

Dirt roads may be constructed by the Permittees or private landowners to access their property. These projects are subject to construction and post-construction practices but not to project design requirements (**Table 6-3**).

## **Pre-Design Data Collection for Wildlife Movement**

For transportation projects with the greatest potential to affect wildlife movement (see **Table 6-3** and lists above), it will be important to incorporate requirements that minimize the projects' adverse impacts on wildlife movement. In some cases, transportation projects may present opportunities to upgrade existing structures to improve wildlife movement. For these upgrades to be most effective, they will be supported by data describing movement of wildlife at or near the project site and the likelihood of vehicle collisions based on traffic patterns.

To facilitate better project design and to avoid delays in project construction due to the data collection process, the Implementing Entity will establish a long-term data collection program on wildlife movement in the study area. The primary goal of this program will be to determine the movement patterns of key covered species and other native wildlife throughout the study area. Data collection stations will be established at points along covered transportation projects that are most likely to affect wildlife movement. Wildlife movement will be studied at key sites to determine which species move through the area, when they move and, most importantly, which landscape features are most often used. Techniques used for data collection will vary by site and target species but may include remote cameras, wildlife track pads, and roadkill observations. This program is described in greater detail in Chapter 5. It is expected that several

years (or decades) of data will be available to inform project design by the time that many of these projects reach the design stage. (This monitoring program is in addition to the wildlife corridor feasibility study discussed in Chapter 5.)

Data collection will be required on wildlife movement along the applicable project corridor for at least 1 year prior to project design. These data will be used to select the design requirements most appropriate for the species and conditions particular to the site (see below). If the Implementing Entity has not collected data in the project vicinity and the project timeline does not permit new data collection, then the applicant must apply all the design guidelines on the basis of the best available information for the region and appropriate to the conditions at the project site.

Transportation project applicants will coordinate with the Implementing Entity and Wildlife Agencies on applicable projects as indicated in **Table 6-3** during the conceptual design phase to ensure that as the project moves from conceptual to final design, the project meets the terms of this Plan.

When multiple road expansions are planned for a roadway during the permit term, wildlife crossing needs will be considered for each roadway as a whole, not by road segment. Further, design requirements will be considered for each wildlife species likely to cross the facility (Barnum 2003). These data will inform the design of wildlife movement structures suitable for the site and the species that use the area. In addition, after each project component is installed, wildlife activity along the road will be monitored to assess how wildlife responded to the project, if behavior has changed, and if additional design considerations will be utilized as future projects are implemented along the roadway.

## Transportation Project Design Requirements

To reduce the impacts of construction activities on natural communities and native species within the study area, the design requirements listed below will be implemented for applicable transportation projects (**Table 6-3**). Design requirements are based on the latest techniques for minimizing impacts of transportation projects (Forman et al. 2002; Irwin et al. 2003; Finch 2004; Hilty et al. 2006). Some design requirements may be updated by the Implementing Entity if the best available science indicates that such updates would be more effective at facilitating safe wildlife movement across transportation corridors. Because the effectiveness of road crossings designed for wildlife is an active area of research, frequent advances in design are expected throughout the permit term.

- **Enhance existing undercrossings.** When road expansion projects span an undercrossing, such as a culvert, existing undercrossing structures will be enhanced within safety or engineering limitations to allow for fish and wildlife movement. Existing culverts or other potential crossing points will be enhanced if results of data collection indicate that the existing structure is inadequate. The design requirements of replacement structures will be

determined by the species that have been documented using or attempting to use the site. Wildlife crossings that can serve multiple species will be used whenever possible.

- ❑ **Crossing enhancements.** Crossing enhancements must incorporate design requirements identified for culverts in Condition 4, *Stream Avoidance and Minimization for In-Stream Projects*.
- ❑ **Minimum sizing of culverts.** Culverts must be the minimum length, height, and width necessary to provide safe passage under the road for the target species present at the site (based on data collected as described above). Culvert designs will be based on the best available data at the time. Current recommendations are that culverts designed for medium-size mammals (e.g., San Joaquin kit fox, coyote, raccoon) be 5–8 feet in diameter (although culverts larger than 8 feet in diameter may be needed for longer crossings). Culverts designed for small mammals or amphibians are recommended at 18–48 inches in diameter. Culverts will provide a natural substrate on which wildlife can travel (e.g., open bottom box culvert) when such designs are compatible with the hydrologic needs of the culvert.
- ❑ **Install grating to allow ambient light to penetrate undercrossing.** Culverts will include grating on the inactive part of the roadbed (e.g., road shoulders or median) to allow filtration of ambient light and moisture but minimize noise intrusion. Artificial lighting inside tunnels or culverts will not be used; these devices have not been shown to be effective and may deter nocturnal wildlife. Such devices may also be vandalized.
- ❑ **Fencing design.** Fencing will be required in areas where high mortality rates of species attempting to cross the road occur. Fencing will be used along the perimeter of the roadway to direct animals to undercrossings and minimize their access to the road. Fencing designs will be tailored to the species expected to use the undercrossing and will be based on the best available data on species use and best fencing designs available at the time. For example, fencing for amphibians will be high enough to prevent amphibian crossing but low enough to allow movement of other species (e.g., deer, badgers, etc.). Fencing will extend out from the undercrossing along the road to an appropriate distance that will serve as a barrier to wildlife attempting to cross the road. The distance that fencing extends from the undercrossing will be determined on a case-by-case basis and will consider locations of known collisions in the area. Right-of-way fencing could be designed to serve this purpose. Fencing must be attached to the undercrossing to prevent wildlife from passing through a gap between the undercrossing and the beginning of the fence.  
  
Fencing must be monitored regularly by the facility owner and repairs made promptly to ensure effectiveness. Vegetation must be managed along small mammal and amphibian fencing to reduce the opportunity for these species to climb the fence. Fencing designed for small mammal or amphibian exclusion must be installed at least 8 inches into the soil to prevent small mammals from tunneling under the fence.

Where low-traffic side roads (e.g., ranch roads) cross the wildlife fences along the main roadway, gates will be used whenever possible to avoid creating a gap in the fence that wildlife could move through. The gate will be designed to minimize the gap between the gate and the roadbed. If gates are not feasible, an in-roadway barrier (e.g., wildlife grates) or device that channels species away must be installed to deter wildlife from moving around fences and into the road.

- ❑ **Passage placement.** New passages will only be placed or located in areas that connect two viable habitats so that wildlife is not directed into urbanized areas.
- ❑ **Road or rail barrier designs.** When compatible with vehicle and train safety, road and rail median barriers or shoulder barriers will allow wildlife to cross under or over the barrier in the event they become trapped in the right-of-way. For example, one-way gates could be used to allow movement out of the hazardous zone but not into it.

## Construction Practices

The following construction practices apply to categories of transportation projects listed in **Table 6-3**.

### Avoidance and Minimization Measures for Transportation Projects

- Minimize ground disturbance to the smallest area feasible.
- For construction of new dirt roads, prevent rills (a narrow groove or crack in the road resulting from erosion by overland flow) by breaking large or long bare areas up into smaller patches that can be effectively drained before rills can develop (Fishery Network of Central California Coastal Counties 2004).
- For construction of new dirt roads, disconnect and disperse runoff flow paths, including roadside ditches, which might otherwise deliver fine sediment to stream channels (Fishery Network of Central California Coastal Counties 2004).
- For construction of new dirt roads, prevent gullies by dispersing runoff from road surfaces, ditches and construction sites, by correctly designing, installing and maintaining drainage structures (e.g., road shape, rolling dips, out-sloped roads, culverts, etc.) and by keeping streams in their natural channels. No single point of discharge from a road or other disturbed area should carry sufficient flow to create gullies. If gullies continue to develop, additional drainage structures are needed to further disperse the runoff (Fishery Network of Central California Coastal Counties 2004).
- When constructing or reconstructing a ditch, utilize designs for outlet locations that avoid directly dumping ditch water into surface waters, when practical. If not practical, implement sediment management avoidance and minimization measures to trap sediment before it reaches a stream. Avoidance and minimization measures described in Condition 3 and

Condition 4 will be applied as appropriate (Fishery Network of Central California Coastal Counties 2004).

- When designing or redesigning roads, look for opportunities to restore natural drainage patterns. Install culverts or rolling dips to retain water in its drainage of origin, which will decrease the potential for erosion downstream. On problem roads, look for opportunities to reconstruct the road segment to improve and maintain natural drainage patterns; for example, add rolling dips, emergency water bars and additional cross drains (Fishery Network of Central California Coastal Counties 2004).
- When constructing dirt roads, install road surface and ditch drainage structures frequently enough so that gullies do not form at drainage points and so that the road and drainage system are generally dry (Fishery Network of Central California Coastal Counties 2004).
- Equipment storage, fueling, and staging areas will be sited on disturbed areas or on non-sensitive nonnative grassland land cover types, when these sites are available, to minimize risk of direct discharge into riparian areas or other sensitive land cover types. When such sites are not available, staging will occur on the road used to access the site.
- All species survey requirements of this Plan will be followed within the construction zone (i.e., the limit of project construction plus equipment staging areas and access roads) and the entire road right-of-way. Expanding the survey area beyond the project footprint will help identify covered species and their habitats so that impacts on covered species that occur adjacent to the construction zone can be minimized.
- No erodible materials will be deposited into watercourses. Brush, loose soils, or other debris material will not be stockpiled within stream channels or on adjacent banks.
- Silt fencing or other sediment trapping methods will be installed below the grade of new road construction or road widening activities to minimize the transport of sediment off site.
- Temporary barriers will be constructed to keep wildlife out of construction sites, as appropriate.
- Onsite monitoring will be conducted by a qualified biologist throughout the construction period to ensure that disturbance limits, avoidance and minimization measures, and Plan restrictions are being implemented properly.
- Use existing roads for access and disturbed area for staging as site constraints allow. Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants.
- Active construction areas will be watered regularly to minimize the impact of dust on adjacent vegetation and wildlife habitats, if warranted.
- Portions of the project that occur in streams (e.g., bridge or culvert construction) will comply with Condition 4.

## Post-construction Practices

Following construction, the areas beyond road shoulders and inside the right-of-way will be returned to a pre-project or ecologically improved condition. These actions will likely be applied differently to each road project and will decrease the potential for the spread of nonnative species.

- Invasive plants within the project area and any construction staging areas will be removed to prevent the spread of these species into nearby or adjacent reserves.
- All disturbed soils will be revegetated with native plants and/or grasses or sterile nonnative species suitable for the altered soil conditions upon completion of construction. Local watershed native plants will be used if available. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives. All disturbed areas that have been compacted shall be de-compacted prior to planting or seeding.
- Vegetation and debris will be managed in and near culverts and under and near bridges to ensure that entryways remain open and visible to wildlife and that the passage through the culvert or under the bridge remains clear.

All structures constructed for wildlife movement (tunnels, culverts, underpasses, fences) will be monitored at regular intervals by the Local Partner facility owner and repairs made promptly to ensure that the structure is in proper condition. For facilities owned by entities not participating in the Habitat Plan (e.g., California Department of Transportation [Caltrans]), the Implementing Entity will secure access and data collection agreements with these entities to allow the Implementing Entity to conduct this monitoring.

## Condition 7. Rural Development Design and Construction Requirements

For this Plan, rural development is defined as any new development that occurs outside of the urban service area at the time the development is permitted under the Plan, or those areas within the urban service area that are only covered for development consistent with rural land uses. The rural development covered activities listed below are subject to this condition and to the applicable permitting process of the local jurisdiction.

- Residential development (e.g., single family homes, subdivisions) consistent with the County General Plan (County of Santa Clara 1994). Ancillary improvements may include privately owned bridges, driveways, access roads, vineyards or orchards, and other accessory structures associated with rural dwelling units.
- Non-residential development consistent with the County General Plan (County of Santa Clara 1994). This includes new commercial facilities

(institutional, industrial) agricultural facilities (mushroom farms, commercial stables, and equestrian event facilities) or similar uses that obtain building, grading and/or other development permits, consistent with local general plans, such.

- Vineyard, orchard, or other farming activity that obtains a building, grading, or development permit from the County or City.
- Residential or non-residential development on the non-urban hillsides of eastern San José (outside the planning limit of urban growth) and in the Coyote Valley Urban Reserve and South Almaden Valley Urban Reserve consistent with the San José General Plan.
- Residential or non-residential development in the Morgan Hill Southeast Quadrant consistent with the Morgan Hill General Plan.
- Residential or non-residential development in the Hecker Pass Specific Plan area consistent with the Gilroy General Plan.
- Projects, including capital projects, implemented by Permittees outside the urban service area.

As described in Chapter 4, rural development in hillside and natural areas that will remain rural has a greater potential for direct and indirect impacts on sensitive habitat and more covered species than urban development in already developed areas for a number of reasons. First, rural development tends to occur on larger parcels or in less constrained sites, affecting larger areas. Second, the existing landscape in hillside and natural areas is generally less disturbed prior to project construction on rural development sites than on urban sites. Third, rural development tends to occur near or in areas with native vegetation and higher biological values, including areas near or adjacent to the Reserve System. Rural development in natural areas tends to increase habitat fragmentation, which degrades or disrupts landscape connectivity. New driveways and roads associated with rural development may create new hazards or barriers to species dispersal. Indirect impacts also occur at both the development site and the landscape level, as rural development can introduce new sources of noise, light and glare, air pollution, and vehicle traffic in more remote areas. Despite the potential for these adverse effects on natural communities and covered species, rural development projects often have greater flexibility to modify designs to reduce or minimize impacts on covered species and natural communities than projects in urban areas.

As described in Chapter 4, existing land use restrictions and requirements also substantially limit the footprint and extent of rural development. For example, almost all of the areas intended to be incorporated into the Reserve System (see Chapter 5) are large land holdings designated as Hillside or Ranchland land uses under the County General Plan. In these areas, the maximum development density allowed is one residence per 20 to 160 acres, based on the average slope of a parcel. Subdivision of sites designated Hillside or Ranchland seldom occurs and this pattern is not expected to change during the permit term due to the physical challenges of development in most of the study area. Under County policies, most subdivision proposals for Hillside parcels are required to cluster

future development and preserve a minimum of 90% of the site as open space. If suitable, these large set-asides could be incorporated into the Reserve System. County policies and regulations also require that grading be minimized in Hillside and Ranchland areas through the site design process, which emphasizes compact development. These land-use restrictions help to minimize the effects of rural development on covered species and natural communities.

The primary goal of this condition is to minimize the potential direct and indirect impacts of rural development in areas that will remain primarily rural on covered species and natural communities most likely to be affected by rural development (see Chapter 4, including **Table 4-1**, for an accounting of which species could be affected by rural development). Additional goals of this condition are listed below.

- Minimize habitat fragmentation and degradation of landscape linkages (e.g., wildlife corridors), including maintaining connectivity between aquatic, riparian, and upland habitats.
- Minimize loss of sensitive land cover types and natural communities including but not limited to riparian woodlands, seasonal wetlands, freshwater marsh, ponds, serpentine grassland, valley oak woodland, knobcone pine woodland, and ponderosa pine woodland.
- Reduce the extent of new roads in remote rural areas in order to reduce negative impacts on species.
- Minimize degradation of streams and maintain the hydrograph to the baseline (defined as the existing conditions at the time of Plan approval), or adjust the hydrograph toward predevelopment conditions<sup>11</sup>.
- Minimize construction-related impacts, including noise; air emissions; erosion and sedimentation; disturbance of native vegetation; and introduction of nonnative, invasive species.
- When designing or retrofitting County facilities, evaluate whether the project can be designed to reduce impervious surfaces to less than pre-project conditions.

This condition integrates existing County requirements with additional avoidance and minimization measures that are intended to reinforce current regulations and support the goals of this condition. The design requirements and conditions for all rural development covered by the Plan are listed below and will be applied as applicable.

### **Design and Construction Requirements**

Projects subject to this condition are required to follow the following measures.

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<sup>11</sup> The hydrograph will be monitored using existing stream gages within the study area, new gages proposed under the plan, and could be monitored at large developments occurring during the Permit Term, as deemed appropriate by the Implementing Entity.



- Plans presented to local jurisdiction planning staff by private applicants for discretionary approval or a building permit process must identify the proposed impact area and general location of site design features (e.g., residence, access road, leach field, wells, vineyards, accessory structures, etc.). The site plan will show all improvements that will result in permanent land cover impacts (e.g., home, driveway, barn, pool, patio, landscaping, and utilities, etc.), including a 50-foot buffer around all proposed site improvements. The project area plus the 50-foot buffer is called the *development area*. This site plan will also show all site improvements that will result in temporary land cover impacts during construction but that will be returned to the pre-project land cover type within 1 year of completing construction (e.g., leach fields, well pipelines that do not result in permanent habitat disturbance), including a 10-foot buffer around the proposed footprint of the site improvements. Plans do not need to show buffer areas (50 feet for permanent improvements and 10 feet for temporary improvements) that cross property boundaries (e.g., a house 30 feet from a property line only needs to show the buffer area up to the property line). **Figure 6-1** provides an example map of the information required on the site plan. (**Figure 6-1** also defines the development area for the purposes of determining survey areas [see Section 6.8.5 *Item 5: Results of Applicable Species Surveys and Monitoring*] and calculating development fees [see Chapter 9, Section 9.4.1 *Habitat Plan Fees*]).
- Minimize ground disturbance to the smallest area feasible.
- Build close to, and utilize to the extent practicable, existing infrastructure (e.g., existing driveways, utility lines).
- Use existing roads for access and disturbed areas for staging as site constraints allow. Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants.
- Adhere to Condition 10, *Fuel Buffer*.

### Site Hydrology

- Develop only the minimum number of stream crossings necessary to access the property.
- At project sites that are adjacent to any drainage, natural or manmade, exposed soils must be stabilized or otherwise contained on site to prevent excessive sediment from entering a waterway.
- Use of impermeable surfaces surrounding structures must be minimized to the greatest extent possible through the use of alternative design treatments, such as low impact development methods, including but not limited to, permeable pavers, green roofs, and rainwater catchments so that natural infiltration is facilitated and runoff is reduced.
- Consistent with State and Regional Water Quality Control Board regulations, runoff from impermeable surfaces must be directed to natural or landscaped areas, or to designed swales or detention/retention basins to encourage

natural filtration and infiltration. Diversion to a cistern or other onsite stormwater management technique is also allowed and encouraged.

- Avoid and minimize impacts associated with altering natural drainages and contours on the project site. If the site is graded, blend grading into the existing landform as much as possible.
- Leach fields must be sited away from creeks in accordance with the County septic ordinances, as well as at least 100 feet from the reserve boundary. Leach field installation may result in localized soil moisture content and groundwater levels that may have adverse effects on sensitive plants or plant communities in the Reserve System. Leach fields may be sited within the 100-foot setback if site-specific conditions (i.e., topography) adequately minimize effects, or adequate space is not available to site the field elsewhere (i.e., the parcel is too small).
- Adhere to Condition 3, *Maintain Hydrologic Conditions and Protect Water Quality*.
- Adhere to Condition 4, *Stream Avoidance and Minimization for In-Stream Projects*.
- Adhere to Condition 5, *Avoidance and Minimization Measures for In-Stream Operations and Maintenance*.
- Adhere to Condition 11, *Stream and Riparian Setbacks*.

### **Vineyards**

The following conditions apply to new vineyards that are covered by the Habitat Plan (i.e., those requiring a permit from the County or other local jurisdiction) and are encouraged for new and existing vineyards that do not require a development permit.

- During construction, use cover crops, straw mulch, straw wattles/fiber rolls, coconut husks, or other equivalent erosion control mechanism to prevent sediment from being blown or washed from the project site.
- All disturbed areas will be protected during the rainy season (October 15–April 15). Permanent or temporary measures to prevent erosion must be utilized during vineyard planting. Permanent measures must be utilized once planting is completed. Erosion control measures must be in place by October 15.
- Plant vine rows along existing contours to slow runoff and reduce erosion on hillsides (California Sustainable Wine Growing Alliance 2002a).
- A stormwater management system designed for an average storm recurrence interval of not less than 25 years will be installed on the vineyard site. The system will allow excess stormwater runoff to be carried through the vineyard site with minimum erosion and consistent with the overall drainage patterns present in the area. This requirement may be met by either temporary or permanent measures while vineyard planting work is being

carried out, but shall be met by permanent measures by the time vineyard planting work is completed.

- A sediment control system designed to minimize the discharge of sediment from the vineyard site will be installed on the vineyard site. This requirement may be met by either temporary or permanent measures while vineyard planting work is being carried out, but will be met by permanent measures by the time vineyard planting work is completed.
- If open conduits are used as part of the stormwater management system, plant conduits with grasses and other vegetation to filter sediment, pesticides, and fertilizers from runoff and to reduce the potential that the stormwater conduit itself will erode.
- As part of the stormwater and sediment management systems, install vegetated swales, detention basins, extended vegetated buffer, or other similar feature on the downslope edge of the planted area to capture and treat runoff before it enters local streams. This will minimize the amount of sediment, fertilizers, and pesticides that enter local streams.
- Heavy equipment will not be utilized on dirt access roads immediately after rain to prevent roads from turning to mud and sediment from running off the roads (California Sustainable Wine Growing Alliance 2002a).
- Use of natural pest management approaches in place of pesticides is highly encouraged.
- Maintain a buffer of natural vegetation, including grasses, shrubs, or mature trees, around the perimeter of the vineyard to reduce topsoil erosion and provide habitat for birds that will prey on rodents (California Sustainable Wine Growing Alliance 2006).

### **Private Rural Roads**

- Minimize to the maximum extent possible the amount of ground disturbance when constructing roads.
- Ground-disturbing activities associated with road construction should be timed to occur during dry weather months to reduce the possibility of landslides or other sediment being transported to local streams during wet weather.
- If construction extends into wet weather, the road bed will be surfaced with appropriate surfacing material to prevent erosion of the exposed roadbed (Pacific Watershed Associates 1994).
- Avoid, to the extent possible, constructing roads on steep slopes (over 25%) or on unstable slopes.
- If construction on steep slopes is required, construction will be timed for dry weather months to reduce the potential for landslides.
- Adhere to the avoidance and minimization measures for dirt road construction in Condition 6 under *Avoidance and Minimization Measures for Transportation Projects* (see first three bullets under heading).

### Other Requirements

- Maintain as much natural vegetation as possible, consistent with fuel management standards, on the project site.
- Maintain County-mandated fuel buffer (variable width by slope conditions).
- On sites adjacent to reserves, locate the proposed development as far from the reserve boundary as possible consistent with other onsite conditions and constraints and adhere to Condition 2, *Incorporate Urban-Wildland Interface Design Elements*.
- All temporarily disturbed soils will be revegetated with native plants and/or grasses or sterile nonnative species suitable for the altered soil conditions upon completion of construction. Local watershed native plants will be used if available. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives. All disturbed areas that have been compacted shall be de-compacted prior to planting or seeding.
- All temporarily disturbed areas, such as staging areas, will be returned to pre-project or ecologically improved conditions within 1 year of completing construction or the impact will be considered permanent.
- No plants identified by the California Invasive Plant Council as invasive<sup>12</sup> will be planted on the project site. Planting with watershed local native and/or drought-resistant plants is highly encouraged. This reduces the need for watering as well as the need for fertilizers and pesticides.
- Outdoor lighting will be of low intensity and will utilize full cutoff fixtures to reduce light pollution of the surrounding natural areas.

Project proponents must continue to adhere to all applicable local planning ordinances including: noise ordinances, zoning ordinances, fuel management guidelines for fire buffers, NPDES permit requirements, Water Collaborative guidelines and standards, Santa Clara County grading ordinance, and drainage manual.

## 6.4.5 Rural Operations and Maintenance

Rural operations and maintenance activities—such as operations and maintenance of utility lines and facilities, road maintenance, vegetation management, and mitigation monitoring—have the potential to affect covered species by disturbing nesting covered bird species, leading to sediment discharge, and spreading of nonnative invasive species. Condition 8 would reduce the severity of such impacts.

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<sup>12</sup> See <[www.cal-ipc.org/ip/inventory](http://www.cal-ipc.org/ip/inventory)> for the latest list of invasive species.

## Condition 8. Implement Avoidance and Minimization Measures for Rural Road Maintenance

Road maintenance activities have the potential to directly affect covered species through management activities such as mowing, and may indirectly affect covered species by introducing sediment and other pollutants into downstream waterways and by spreading invasive weeds. Effects on covered species may be greatest on unpaved roads due to their erosion potential. The County maintains an extensive network of paved and unpaved roads. All roads maintained by the County Roads and Airports Department in the study area are paved, except for a portion of one road<sup>13</sup>. County Parks maintains an extensive network of unpaved maintenance and emergency access roads within their parks that often serve primarily as recreational trails. SCVWD maintains a small network of paved and unpaved roads, mostly on levees and along pipelines. Gilroy and Morgan Hill do not maintain any dirt roads outside of the planning limit of urban growth.

To avoid and minimize these impacts, avoidance and minimization measures were developed to address potential impacts associated with road operation and maintenance activities. The avoidance and minimization measures in this condition are based largely on the guidelines in *County Road Maintenance Guidelines for Protecting Aquatic Habitat and Salmon Fisheries* (Fishery Network of Central California Coastal Counties 2004). This manual, also called FishNet 4C, was developed by six central California counties (Mendocino, Sonoma, Marin, San Mateo, Santa Cruz and Monterey counties) and included input from cities, local Resource Conservation Districts, and water agencies. This manual identifies best management practices to protect water quality and aquatic habitat when implementing routine and emergency road maintenance activities. These guidelines incorporate avoidance and minimization measures from other road maintenance programs (e.g., the Oregon State Department of Transportation's *Road Maintenance Manual*, and the Northern Five Counties Salmon Conservation Group's *A Water Quality and Stream Habitat Protection Manual for County Road Maintenance in Northwestern California Watersheds*) (Fishery Network of Central California Coastal Counties 2004). Avoidance and minimization measures identified in the FishNet 4C guidelines are included in **Table 6-4** as part of this condition. In addition to the avoidance and minimization measures in **Table 6-4**, project proponents will comply with the avoidance and minimization measures listed below. Avoidance and minimization measures identified in this condition will be used for all covered road operation and maintenance activities.

- Projects occurring in streams or riparian setback zone will also comply with Condition 4 and Condition 5 as appropriate.
- Minimize ground disturbance to the smallest area feasible.
- Within the riparian setback zone (see Condition 11), silt fencing or other sediment control device will be installed downslope from maintenance

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<sup>13</sup> The one unpaved road maintained by County Roads and Airports in the study area is 1.75 miles of Mount Madonna Road between Redwood Retreat Road and Summit Road (the county line).

activities that disturb soil (e.g., blading of fire or access roads within Parks or the Reserve System) to minimize the transport of sediment off site.

- In the course of rural road maintenance, no erodible materials will be deposited into watercourses. Brush, loose soils, or other debris material will not be stockpiled within stream channels or on adjacent banks where it could be washed into the channel.
- Alternatives such as mechanical control will be considered to substantially lessen any significant impact on the environment before using pesticides. Integrated pest management avoidance and minimization measures will be used for all vegetation control. Limitations may occur due to fire management requirements and local integrated pest management ordinances.
- The effects of herbicide and pesticide application will not be covered under the federal permits for this Plan. Herbicides and pesticides will be used only when necessary and will be applied in strict compliance with label requirements and state, federal, and local regulations. Herbicides and pesticides will only be applied when weather conditions will minimize drift and impacts on non-target sites.
- Maintenance activities on rural roads adjacent to natural land cover types will be seasonally timed, when safety permits and regulatory restrictions allow, to avoid or minimize adverse effects on active nests of resident and migratory birds, including covered bird species (western burrowing owl, least Bell's vireo, and tricolored blackbird). This measure is particularly relevant for right-of-way mowing<sup>14</sup>, brush clearing, prevention of disease spread (i.e., sudden oak disease), and tree trimming. Project proponents will coordinate with the Implementing Entity to develop work schedules that optimize logistic, safety, and financial needs while minimizing potential impacts on nesting birds.
- Mowing equipment will be thoroughly cleaned before use in rural areas so they are free of noxious weeds (e.g., yellow star-thistle) and do not introduce such weeds to new areas.
- Maintenance or repair of road medians or shoulder barriers in areas that support natural land cover types (e.g., annual grassland, oak savanna, oak woodland) will not reduce the ability of wildlife of all types to move through or over them, within safety limits. Replacement or repair of road medians will be designed or installed to allow wildlife to move past these structures. Exceptions may be made by the Permittee if significant safety concerns or financial constraints arise.
- All disturbed soils will be revegetated with native plants and/or grasses or sterile nonnative species suitable for the altered soil conditions upon completion of construction. Local watershed native plants will be used if available. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-

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<sup>14</sup> For example, County Parks has a Memorandum of Understanding with the California Department of Forestry and Fire Protection (Cal-Fire) that limits mowing to November to April to minimize fire hazards. There may be other public safety restrictions that limit the ability to achieve this guideline.

term erosion control and slow colonization by invasive nonnatives. All disturbed areas that have been compacted shall be de-compacted prior to planting or seeding.

- Ground-disturbing road maintenance activities, such as regrading, will be timed so that the moisture content of the soil will support recompaction of the soil and reduce the need for an imported water source to achieve soil compaction. Similarly, activities will be timed so that use of heavy equipment will not result in the creation of mud puddles and ruts.
- Regularly scheduled visual inspections of all roads will be conducted to identify sites where erosion is contributing sediment to local streams. Appropriate actions will be taken within the road right-of-way to manage the erosion.
- Flow lines (e.g., culverts and ditches) will be cleared annually to maintain flow lines free of debris.
- Use existing roads for access and disturbed area for staging as site constraints allow. Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants.
- All new public roads that are accessible to general public vehicular use will be paved (this does not include fire roads that may also serve recreational needs).

## 6.4.6 Reserve System Implementation

Reserve System implementation—which includes activities associated with recreation, construction, infrastructure design, and maintenance of the reserves—could result in localized effects on covered species and their habitats. All relevant conditions will be applied to construction and maintenance activities within the Reserve System.

## Condition 9. Prepare and Implement a Recreation Plan

Public access, consistent with the Habitat Plan conservation strategy, will be provided on all reserves owned in fee title by a public agency. Public access to privately owned land under conservation easement will only be permitted with the landowner's consent. See Chapter 10 *Assurances* for more details.

All public access to reserves will be managed according to a recreation plan that will be developed by the landowner (e.g., County Parks, Open Space Authority) and/or the Implementing Entity consistent with the requirements of this condition. Recreation plans will be reviewed by the Implementing Entity for consistency with this condition and integrated into the applicable reserve unit management plan which will be reviewed and approved by the Permittees and the Wildlife Agencies. Wildlife Agency approval of reserve unit management plans

will follow the timelines established in Chapter 5, Section 5.2.5 *Land Management* subheading *Land Management on Reserves*.

The recreation plan will address lands that are acquired for or incorporated into a reserve unit where the Implementing Entity and the land owner determine that recreational and educational uses are compatible with the conservation strategy of this Plan. Each recreation plan will apply to the portion of the reserve unit for which the recreation plan was developed, including existing open space that is incorporated into the unit (existing open space selected for the Reserve System was chosen, in part, for its recreational uses that are compatible with the biological goals and objectives of the Plan).

At a minimum, each recreation plan will contain the requirements listed below.

- Identification of sites within reserves where recreational use is compatible with the goals and objectives of the Plan.
- Identification of acceptable forms of recreation if different from those forms identified in this condition.
- Identification of sites within reserves that contain sensitive land cover types or suitable or occupied habitat for covered species.
- Maps of existing and proposed recreational trails, staging areas, and facilities and of habitat types affected.
- Site-specific methods of recreational use controls.
- Trail and use monitoring methods, schedules, and responsibilities.
- Trail operation and maintenance guidelines and responsibilities. This includes control of active off-trail recreational activities determined inappropriate by Implementing Entity and Wildlife Agencies.
- A framework for enforcement of recreational restrictions and permitting process for restricted recreational uses.
- An evaluation determining if the impact of planned recreational use is within the limits established in the Plan and EIS/EIR, and if planned recreation is compatible with the biological goals and objectives of the Plan.
- Clear triggers for use restrictions or closure based on sensitive biological indicators (e.g., seasonal closures of some trails on the basis of activity periods of covered or sensitive species).

Land acquired for reserves will be closed to all recreational uses until a recreation plan is developed and approved as part of a reserve unit management plan. Existing recreational uses on land incorporated into the Reserve System from existing open space (e.g., County Parks) will continue until the reserve unit management plan and associated recreation plan is completed. Existing open space selected for the Reserve System was chosen, in part, because of its compatible recreation uses with the conservation strategy (see **Table 5-5** and **Figure 5-4**). Until the reserve unit management plan is completed, no additional



recreational uses beyond what is currently allowed will occur on that existing open space incorporated into the Reserve System.

Recreational uses in the Reserve System will be designed to minimize impacts on biological resources and must adhere to the requirements and guidelines listed below.

- Recreation will only be allowed where it is compatible with the biological goals and objectives of the Plan and has less-than-significant impacts on biological resources after implementation of necessary mitigation measures, as described in the EIR/EIS.
- Recreational use and impacts will be monitored by the landowner and the Implementing Entity to ensure that uses do not substantially and adversely affect covered species. If any use is found to be substantially adversely affecting covered species, that use will be discontinued until adjustments in the use can be made to reduce or eliminate impacts (see Chapter 7 for details on monitoring). The Implementing Entity will make decisions about discontinuing or modifying recreational uses in close consultation with the landowner or other applicable reserve management agency or organization, and through a public process.
- Recreational uses allowed in reserves include pedestrian use (walking, hiking, running), dogs on leash, backpacking, nonmotorized bicycle riding on designated trails, horseback riding, wildlife observation and photography, and environmental education and interpretation on designated trails at appropriate sites. Other uses may be allowed by the Implementing Entity as long as they are compatible with the biological goals and objectives of the Plan and users obtain appropriate permissions for conducting activities if needed (e.g., County Parks requires a permit for professional photography).
- Allowable recreational uses will be controlled and restricted by area and time to minimize impacts on natural communities and covered species and to ensure that the biological goals and objectives of the Plan are met. For example, trails will be closed during and immediately following heavy rains and annually winterized to minimize erosion and sedimentation. Additional types of recreational uses (e.g., horse carts on trails) may be allowed if the Implementing Entity determines that they are consistent with the biological goals and objectives of the Plan, CDFG and USFWS concur, and users obtain appropriate permissions for conducting activities if needed (e.g., County Parks requires a permit for use of horse carts).
- Activities will be allowed in keeping with the ecological needs of the given habitat. Any off trail activities and other active recreation not listed above (e.g., outdoor sports, geocaching) unless otherwise authorized by the Implementing Entity are prohibited. Recreational uses will be allowed only during daylight hours and designated times of the year (i.e., limited seasonal closures to protect sensitive covered species; see below for specific examples) unless authorized through a use permit (i.e., backpacking). Exceptions may be made for educational groups and events that are guided by an Implementing Entity staff person or docent approved by the Implementing Entity.

- New staging areas will be developed to the extent possible in areas within reserves that are already disturbed and not suitable for habitat restoration, and that do not contribute to the conservation biological objectives for covered species habitats and/or natural communities. Sites at the edges of reserves will be chosen over sites on the interior of reserves.
- No motorized vehicles or boats will be allowed in reserves, except for use by the reserve manager staff or with the prior approval of the reserve manager (e.g., contractors implementing Plan conservation actions such as habitat restoration and monitoring, grazing tenants, fire-suppression personnel, and maintenance contractors). For reserves under conservation easements, vehicle use will be allowed as part of the regular use of the land (e.g., agricultural operations, permanent residents, utilities, police and fire departments, other easement holders), as specified in the easement.
- When compatible with Plan biological goals and objectives, dogs may be allowed in daylight hours in designated reserves or in designated areas of reserves, but only on leash. Leash law restrictions will be strictly enforced by reserve managers and staff because of the potential impact of dogs on covered species such as San Joaquin kit fox, western burrowing owl, California red-legged frog, and California tiger salamander. Leash enforcement may include citations and fines. Dogs used for herding purposes by grazing lessees must be under verbal control and have proof of vaccination.
- Recreational hunting or fishing within reserves will be prohibited except in limited circumstances. Landowners who have hunted large game (e.g., deer, elk, turkey, or pigs) on their property that becomes part of the Reserve System through a conservation easement will be allowed to continue this use as long as it is consistent with the biological goals and objectives of the Plan. Similarly, hunting for management purposes (e.g., feral pigs) is encouraged where it will contribute to achieving the goals and objectives of the Plan. The Implementing Entity will develop management hunting protocols on new reserve lands in coordination with other agencies who utilize hunting for management purposes (e.g., CDFG). Fishing is currently allowed in some County parks that will be added to the Reserve System. To be consistent with this condition, lakes or ponds in which fishing will continue will not be included in the Reserve System.
- Picnic areas shall be operated during daylight hours only. No irrigated turf or landscaping shall be allowed in picnic areas. To the extent feasible, picnic areas will be located on the perimeter of preserve areas and will be sited in already disturbed areas. No private vehicles shall be allowed in picnic areas, unless the picnic area is at a staging area and except for limited special events approved by the Implementing Entity. Maintenance and emergency vehicles shall be permitted access to picnic areas.
- Backpack camps shall be limited to use by no more than 25 people at each site. With the exception of Americans with Disabilities Act (ADA) service animals, dogs shall only be allowed in backpack camps on-leash. In coordination with the reserve manager, the Implementing Entity will monitor

use and maintenance of backpack camps and may implement a reservation and permitting process for use of backpack camps.

- Public collecting of native species will be prohibited within reserves.
- Introduction of domestic or feral animals, including cats, ducks, fish, reptiles, and any exotic non-naturalized species, is prohibited within the reserves to prevent interference with and mortality of native species, except by the reserve manager for management purposes (e.g., livestock for grazing or dogs for livestock control or protection).
- Trails will be established on existing roads or trails wherever possible to minimize the need for new ground-disturbing activities and to reduce new and ongoing maintenance costs. However, this will be balanced with the need to reroute some poorly designed existing ranch roads that are difficult and expensive to maintain. In some cases, rerouting access roads may have net benefits on biological resources.
- New trails will be designed and operated to be compatible with natural resources protection. New trails will be sited to minimize impacts on sensitive species (including covered species) and natural communities as well as disturbance to adjacent landowners and land uses. Wetlands will be avoided except for educational trails, and trails through woodland or riparian habitat will avoid tree removal or substantial pruning to the extent possible. If tree removal is required, unhealthy, exotic tree species, or trees unlikely to reach maturity due to site conditions (e.g., being shaded out by larger trees) will be targeted for removal.
- Trails built across streams or through riparian corridors will be sited and designed with the smallest footprint necessary to cross the in-stream area. Stream crossings will be perpendicular to the channel and be designed to avoid any potential for future erosion. Trails that follow a stream course will be sited outside the riparian corridor to the maximum extent feasible.
- Trails will not be paved, except as required by law, and will be sited and designed so that they do not contribute to erosion and bank failure. To provide trail access for a range of user capabilities and needs (including persons with physical limitations) in a manner consistent with state and federal regulations, the landowner would site and design new, paved trails in areas within reserves that are already disturbed and do not have the potential to affect sensitive habitat. As common practice, these types of whole-access trails would be sited near staging areas.
- Recreational uses will be controlled using a variety of techniques including fences, gates, clearly signed trails, educational kiosks, trail maps and brochures, interpretive programs, and patrol by land management staff.
- Construction of recreational facilities within reserves will be limited to those structures necessary to directly support the authorized recreational use of the reserve. Existing facilities will be used where possible. Facilities that support recreation and that may be compatible with the reserve include parking lots (e.g., small gravel or paved lots), trails (unpaved or paved as required by law), educational and informational kiosks, up to one visitor

center located in a disturbed or non-sensitive area, and restroom facilities located and designed to have minimal impacts on habitat. Playgrounds, irrigated turf, off-highway vehicle trails, and other facilities that are incompatible with the goals and objectives of this Plan will not be constructed.

- Signs and informational kiosks will be installed to inform recreational users of the sensitivity of the resources in the reserve, the need to stay on designated trails, and the danger to biological resources of introducing wildlife or plants into the reserve.
- New trails will be prohibited within 100 feet of wetlands and streams that provide suitable habitat for covered amphibians and aquatic reptiles or tricolored blackbird, unless topography or other landscape characteristics shield these trails from the covered species habitat or a lack of effect of the trail on the species can be otherwise demonstrated.
- New trails will be prohibited within 250 feet of active western burrowing owl nests. If an owl pair nests within 250 feet of an active trail, Implementing Entity staff will consult with the Wildlife Agencies to determine the appropriate action to take. Actions may include prohibiting trail use until young have fledged and are no longer dependant on the nest.
- When compatible with Plan biological goals and objectives, recreation plans for reserves adjacent to existing public lands will try to ensure consistency in recreational uses across open space boundaries to minimize confusion in the public. Reserves adjacent to non-Plan public lands with different recreational uses will provide clear signage to explain these differences to users that cross boundary lines. The Implementing Entity will be responsible for securing and signing reserve boundaries.

Rare exceptions to the guidelines listed above will be considered and approved by the Implementing Entity and the Wildlife Agencies on a case-by-case basis. Exceptions will be approved only if they are consistent with the biological goals and objectives of the Plan. Any exceptions will be clearly identified in the recreation plan.

## Condition 10. Fuel Buffer

In accordance with state law<sup>15</sup>, all applicable covered activities will remove all brush, flammable vegetation, or combustible growth within at least 30 feet and up to 100 feet of occupied dwellings or structures. The amount of fuel modification necessary shall take into account the flammability of the structure as affected by building material, building standards, location, slope, and type of vegetation. Fuels will be maintained in a condition so that a wildfire burning under average weather conditions would be unlikely to ignite the structure. The intensity of fuels management may vary within the 100-foot buffer of the structure, the most intense being within the first 30 feet around the structure.

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<sup>15</sup> California Government Code Section 51182 and Public Resources Code 4291.

Consistent with fuels management objectives, steps will be taken to minimize erosion consistent with Condition 7.

Applicable covered activities include construction of new structures in the Diablo Range or Santa Cruz Mountains, or new structures built in grassland, chaparral, oak woodland, or conifer woodland land cover types. This condition also applies to structures built in areas designated by the County as a very high fire hazard severity zone pursuant to Section 51179 of the California Government Code.

If the property line is less than 30 feet from the occupied structure, then the brush and vegetation will be cleared up to the property line in order to maintain compliance with Public Resources Code 4291. Additional brush and vegetation clearing may be required by local or other state laws. To ensure that erosion is minimized, grass and other vegetation within 30 feet of structures will be maintained within this fuel buffer to a height of 18 inches or less. The cost of establishing and maintaining this fuel buffer will be borne by the project proponent. This condition does not apply to single trees or other vegetation that is well-pruned and maintained so as to effectively manage fuels and not form a means of rapidly transmitting fire from other nearby vegetation to a dwelling or structure.

The vast majority of properties adjacent to the Reserve System are expected to be able to create sufficient defensible space within their property to meet this condition. If an additional buffer is deemed necessary by the responsible fire agency, then the private landowner may seek an encroachment permit from the Implementing Entity to meet fire code. In these limited instances, the Implementing Entity may decide to allow a fuel buffer on the reserve side of a property boundary to provide additional protection against wildland fire. The Implementing Entity or land manager would define the allowable activities in encroachment permit to ensure compliance with HCP goals. If this is applied, the fuel management buffer within the reserve will not be credited to the land acquisition requirements in Chapter 5 because this area will be maintained in a disturbed state.

In areas within the Reserve System where management of fuel loads is necessary, the Implementing Entity will trim, mow, conduct prescribed burns, utilize grazing, or otherwise clear vegetation to minimize fuel loads and fire hazards. Various land uses are allowable within the fuel management buffer as long as they reduce fire hazards. Uses such as trails, fire-resistant landscaping, and livestock grazing are compatible with the fuel buffer. Allowable uses must comply with the urban-Reserve System interface guidelines described above.

Creating and maintaining the fuel management buffer within the Reserve System may have impacts on covered species. For example, plants such as Santa Clara Valley dudleya and smooth lessingia may occur in grasslands within fuel buffers. Any impacts on covered plants from fuel buffer management will be counted by the Implementing Entity as an adverse effect that must be offset by conservation of covered plants in the Reserve System (see Chapter 5). In some cases,

maintenance of the fuel buffer may improve habitat for covered plants by reducing cover of nonnative plants.

## 6.5 Conditions to Minimize Impacts on Natural Communities

Conditions 11–14, described below, are designed to minimize impacts on natural communities identified as representing important ecosystems in the Plan area.

### Condition 11. Stream and Riparian Setbacks

This condition applies to all covered activities that may impact streams. This includes all development inside the urban service area where a stream or the stream setback overlaps any portion of the parcel on which a covered activity is being implemented. Outside the urban service area, this includes all covered activities where a stream or stream setback overlaps any portion of the development area or project footprint. Exemptions and exceptions may apply as described below in this condition.

#### Background

The management of stream corridors and associated riparian habitat through the implementation of setbacks has become an increasingly important tool for conserving aquatic and semi-aquatic populations and riparian vegetation and improving water quality. There is strong evidence that riparian buffers of sufficient width protect and improve water quality by intercepting non-point source pollutants in surface and shallow subsurface water flow (e.g., Lowrance et al. 1984; Castelle et al. 1994).

Healthy riparian buffers are also widely recognized for their ability to perform a variety of physical and biological functions other than improving water quality. These functions include stabilizing stream channels; controlling erosion by regulating sediment storage, transport, and distribution; providing organic matter (e.g., leaves and large woody debris) that is critical for aquatic organisms; storing nutrients for the surrounding watershed; reducing water temperature through shading; minimizing flood peaks; and serving as key recharge points for renewing groundwater supplies (DeBano and Schmidt 1989; O’Laughlin and Belt 1995). Riparian buffers also provide habitat for a large variety of plant and animal species. Riparian buffers have been proposed, and in some cases proven, to be landscape components that promote wildlife movement, enhance gene flow, increase connectivity of isolated habitat patches, and provide breeding and foraging habitats for animals (Hilty et al. 2006; Rosenberg et al. 1997).

Within the study area, streams provide important breeding, foraging, and movement habitat for California red-legged frog, foothill yellow-legged frog, and western pond turtle. Riparian woodland, which is found next to many of the study area's streams, provides breeding sites for tricolored blackbird and least Bell's vireo. Riparian woodland habitat also protects water quality by filtering inflow, thus reducing pollutant input and sediment load. Finally, stream and riparian areas provide key linkages connecting conservation areas targeted under the Habitat Plan (see **Table 5-9** and **Figure 5-6**).

Because of the importance of streams and associated riparian woodland for the benefit of covered species and as sensitive land cover types addressed by this Plan, this condition was developed to be as protective as feasible within the land-use constraints of the local jurisdictions and financial constraints of the Habitat Plan. The following principles were developed to guide the stream and riparian setback condition for this Plan.

- Stream habitat and functions are very difficult to replace once lost; in some cases they cannot be replaced.
- Stream setbacks will be required for all covered activities occurring near streams and riparian areas to minimize effects on covered species as required under the ESA and NCCPA. Additional protections adjacent to streams may also be required for urban redevelopment projects.
- Each of the cities participating in the Habitat Plan, as well as the County, has either setback regulations (Morgan Hill) or policies (San José, Gilroy, County of Santa Clara) currently in place. However, these regulations and policies are not consistent among the jurisdictions. A condition is needed that will make regulatory guidance consistent for all covered activities across all jurisdictions. All covered activities must adhere to both the applicable existing local regulations and the requirements of the Plan.
- The main goal of the stream setback requirement is to minimize further degradation of stream and riparian communities from implementation of covered activities and to maintain basic biological and physical functions of stream and riparian systems.
- The purpose of the stream setback requirement within the urban service area is to, at a minimum, protect stream and riparian communities that provide habitat for covered species because these habitats are unique and cannot be conserved elsewhere within the study area.

Protection of streams and adjacent riparian vegetation under this condition would conserve habitat for California red-legged frog, foothill yellow-legged frog, western pond turtle, and least Bell's vireo. All of these species use stream and riparian habitats as either primary or secondary habitat, as described in Chapter 3, *Physical and Biological Resources*.

An analysis was performed to determine the overall value of the setback for protecting covered species' habitat. Modeled habitat protected by the setback was quantified and compared to the level of protection provided by the Reserve System alone. In GIS the habitat models for four covered species (California

red-legged frog, foothill yellow-legged frog, western pond turtle, and least Bell's vireo) were overlaid with the expected locations and widths of riparian setbacks outside of the planning limit of urban growth (setback avoidance is not required inside the urban service area and so those areas were not included in this analysis) for all covered activities except rural residential development (exact location of rural residential development is not known at this time and thus could not be included in the analysis). Assuming all of these covered activities occur, an additional 2,855 acres (28%) of modeled breeding (primary) habitat for California red-legged frog and an additional 348 miles (50%) of modeled habitat (primary and secondary) for foothill yellow-legged frog would be avoided. Also, implementation of the stream setback would avoid an additional 837 acres (55%) of modeled habitat for least Bell's vireo. Setback benefits to these species and western pond turtle are summarized in **Table 6-5**. Stream habitat for covered species will likely overlap (i.e., miles and acres referenced in the table and above are not additive).

## Definitions

The following terms are defined for this condition. These definitions are also found in the glossary (**Appendix A**).

**Riparian habitat or riparian vegetation:** Riparian vegetation is associated with river, stream, or lake banks and floodplains. Riparian vegetation is also defined by USFWS (2009) as plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (i.e., rivers, streams, lakes, or other watercourses). Riparian areas have one or both of the following characteristics: 1) distinctively different vegetation than adjacent areas, 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms due to the greater availability of surface and subsurface water.

**Stream:** A watercourse that flows at least periodically or intermittently through a bed or channel having banks. This may include watercourses having a surface or subsurface flow that supports or has supported riparian vegetation, fish or other aquatic life. In the context of the Habitat Plan, a watercourse must meet SCVWD "*Criteria to Verify or Identify a Watercourse as a Stream*" discussed below under *Framework* (Santa Clara Valley Water Resources Protection Collaborative 2006) to qualify as a stream.

**Reach:** A section of a stream. Reaches are defined based on a specific need (e.g., monitoring) and do not necessarily reflect a standard set of characteristics.

**Perennial stream:** A stream with year-round surface flow that is supplied by both rainfall runoff and groundwater, as well as by substantial dry-season inputs (e.g., runoff).



**Intermittent stream:** A stream that is supplied by both rainfall runoff and groundwater. Intermittent streams tend to be seasonal, with flow during the rainy season and into the late spring or early summer.

**Ephemeral stream:** A stream that flows only in response to rain events and receives no groundwater input. As defined in the Habitat Plan, ephemeral streams will not include irrigation ditches, underground streams, or drainages and swales that have neither defined bed and bank nor evidence of scour or sediment transport. All other ephemeral drainages that qualify as streams will be considered under the Habitat Plan.

## Framework

This condition will apply to all covered activities, including those within the Reserve System. This condition also has exemptions and exceptions as described in subsequent sections below.

The width of the setback is driven by the following criteria:

- stream community,
- slope, and
- location of the covered activity in relation to the urban service area of each local jurisdiction.

Each of these criteria is described below.

### Stream Community

Stream communities are grouped into two simplified categories for the purposes of this condition. These categories are based on broad definitions of the biological characteristics of those communities and correspond to the level of habitat quality for covered species and sensitive riparian communities within the study area. Categories for the stream setback requirement are provided below.

- **Category 1.** This stream type has sufficient flow to support covered species and riparian habitat. These streams include perennial streams and some intermittent streams. These streams are typically larger than ephemeral drainages and support movement of covered species along the length of the stream. The ability of these streams to also support healthy riparian habitats bolsters the ecological value of the stream. This category also includes all in-channel ponds downstream of reservoirs. These streams are shown in **Figure 6-2**<sup>16</sup>.
- **Category 2.** This stream type may not have sufficient flow to support covered species and riparian habitat. These streams include all ephemeral streams and some intermittent stream reaches. These reaches provide minimum support of water-quality functions and primary breeding habitat for

<sup>16</sup> **Figure 6-2** may be periodically updated by the Implementing Entity in consultation with the Wildlife Agencies as new data becomes available.

covered species. Category 2 streams are not specifically mapped as part of the Habitat Plan. They include both identified streams (named creeks and USGS blueline creeks) that are not classified as Category 1 streams (as shown in **Figure 6-2**) and other unmapped streams that meet the “Criteria to Verify or Identify a Watercourse as a Stream” as defined below.

Categories are applied to reaches of streams as opposed to entire streams. This is because almost all streams begin in the uppermost portions of their watersheds as ephemeral streams and gradually become intermittent or perennial and they move downslope and accumulate flows from the watershed and, sometimes, the groundwater basin. As such, a single stream may contain both Category 1 and Category 2 reaches.

The mapped stream network for the Habitat Plan does not differentiate between perennial, intermittent, and ephemeral drainages. However, SCVWD developed a map of all fish-bearing streams in the study area. While fish are not covered by this Plan, presence of fish is a good indicator of the stream type. For example, ephemeral streams do not generally support fish. As such, the stream categories are identified using fish-bearing or non-fish bearing streams as a proxy for Category 1 and Category 2 streams, respectively. Reaches for which fish data are unknown are assumed not to support fish and are included in Category 2. Category 2 reaches cannot occur downstream of a Category 1 reach.

#### **Criteria to Verify or Identify a Watercourse as a Stream**

While all Category 1 streams are mapped by the Plan, not all Category 2 streams are mapped. If a watercourse is not mapped by the Plan, but does meet the following criteria, it will be classified as a Category 2 stream. The following is based on the *Santa Clara Valley Water Resources Protection Collaborative* (2006).

A watercourse which does not appear to fit into one of the two described stream categories may be considered a stream if the director of the planning department of the local jurisdiction determines that the watercourse complies with all of the following three criteria:

1. the watercourse is hydrologically connected to a waterway above and below the site or is connected to a spring, headwaters, lake, and/or bay based on satisfying at least one of the conditions identified in paragraph (A) below; and
2. the watercourse is within a defined channel which includes a bed, bank, and exhibits features that indicate actual or potential sediment movement based on satisfying at least one of the conditions identified in paragraph (B) below; and
3. the watercourse occupies a specific topographic position based on satisfying at least one of the conditions identified in paragraph (C) below.

In determining whether the subject watercourse possesses these three features, the following criteria will be examined by the Local Partner with jurisdiction over the covered activity. If necessary, this determination may require the

technical expertise and recommendations of a qualified biologist, hydrologist, or other qualified professional. In addition, the Local Partner with jurisdiction over the covered activity may require the project proponent to provide additional information as deemed necessary to determine if the watercourse satisfies the three criteria listed below.

This process will not be used to determine if a CDFG Streambed Alteration Agreement will be required pursuant to Section 1600 et seq. of the California Fish and Game Code or to determine if a Corps Section 404 Clean Water Act permit will be required.

**A. Hydrologic Connectivity**—Criterion #1 above will be considered met if any of the following conditions are present:

1. Stream headwaters, springs, in-channel culverts, underground seepage, or groundwater flow are present and capable of providing hydrologic connectivity to recognized watercourses. Sections of stream placed underground by manmade infrastructure (e.g., culverts) are not considered streams for the purpose of this condition except as noted in paragraph B item 4 below.
2. Streams may become connected across or over manmade improvements such as roads (e.g., a temporary connection during a storm event). Except for stream channel improvements, water flowing across or over such improvements within the public right-of-way is not considered a stream. Sections above and/or below this connectivity are streams if they meet the other required features.
3. Springs are present and are considered part of a stream if located above (uphill from) stream initiation.

**B. Channel Form**—Criterion #2 above will be considered met if any of the following conditions are present:

1. The watercourse has a stream channel, beginning at the point of bed and bank initiation, which may be natural, altered, or engineered.
2. The stream channel must have enough flow under present-day conditions to maintain channel form and to move sediment. A non-engineered stream channel bed and bank are created and maintained by erosion and sedimentation, thus the presence of a channel with bed and bank is itself evidence of sufficient flow. Flow volume or timing is not criteria for stream determination.
3. The stream channel has evidence of scour, sedimentation, sediment sorting, undercut banks and/or other erosion, deposition, or transport features—all of which support sediment movement.

Engineered or altered channels exist and are partially or wholly made of earth, concrete, rip rap, or other materials. The hardened nature of these channels bed and banks, and a lack of available sediment along the channel reach, may prevent signs of sediment movement or scour. Such channels need not have explicit evidence of sediment transport.

4. A currently underground stream was filled without appropriate permits from all applicable regulatory agencies (federal, state, and local) or is underground due to a landslide.

**C. Topographic Position**—Criterion #3 above will be considered met if any of the following conditions are present:

1. The watercourse is either a ‘U’ or ‘V’ shaped channel typically located at the low point of a macro-topographic feature.
2. The watercourse consists of bowl, ‘U’, or ‘V’ shaped topography with high points draining to valley or ravine as part of a large drainage network leading to large streams, lakes and/or a bay.
3. The watercourse located on flatland consists of shallow bowl or ‘U’ shaped topography. Generally these streams flow from the hills toward a bay following the slope of the land.

Stream topography can be indicated on a topography map by a ‘U’ or ‘V’ shape pointed in the uphill direction.

**Slope**

Slope is an important determinant of soil stability and therefore erosion and sedimentation rates into streams. Steeper slopes erode faster and are more susceptible to disturbance by the covered activities. To account for these factors, stream setback requirements are greater on steeper slopes. The slope categories developed for the Habitat Plan were based on slope-stability categories in local codes and guidelines. Two slope categories were created. Slope categories are as follows.

- **0%–30% Slopes.** Generally stable slopes. This category does not require additional setbacks beyond those identified above.
- **>30% Slopes.** Increasingly unstable slopes. This category requires increase protection and greater stream setbacks.

If the development area as described in Condition 7 is located within 200 feet of a Category 1 stream, the project proponent will include site topography on the development area map (see Section 6.8.2 *Item 2: Project Description and Map*) in 5-foot intervals in elevation. The project proponent will also calculate the average slope of the development area to determine how this criterion is applied. Slope is defined as the average natural slope of the land within the proposed development area based on an engineered site plan. The average slope is determined by the formula:

$$S = (I * L / A) * 100, \text{ where}$$

*S* is the average slope of the area in percent; *I* is the contour interval in feet; *L* is the combined length of contour lines in feet; and *A* is the area of the development area. Average site slope will be calculated by a registered civil engineer or licensed land surveyor. **Figure 6-3a** illustrates an example setback based on slope.

### Urban Service Area

Different setback distances will be applied depending on whether the covered activity occurs within the urban service area<sup>17</sup> (as adopted and mapped by LAFCO and defined by each city's General Plan at the time of adoption of the Habitat Plan) or outside the urban service area. Within the urban service area of San José, Morgan Hill, and Gilroy, there is typically extensive existing urban development. Due to past land-use policies, this development may have limited or no setbacks from streams. As such, these areas tend to be developed or highly altered from a natural state and the overall habitat value for covered species is less than in the rural areas. The stream setback requirement for covered activities within the urban service area is therefore modest and consistent with existing land uses. This setback also recognizes the limited potential for new development within the urban service area to provide stream protections.

Outside of the urban service area, stream setbacks are greater to maximize protection of existing stream functions and values and to provide additional opportunities for stream and riparian protection and restoration (see Chapter 5). Stream setbacks outside the urban service area take into account the opportunity to establish protective setbacks and to pro-actively prevent degradation seen within the urban service area from past development. The difference between setbacks inside and outside of the urban service area reflects the fact that lands within the urban service area provide a minimum amount of habitat in support of basic ecological functions including connectivity for covered species, while stream and riparian habitat outside of the urban service area will be instrumental in successful implementation of the conservation strategy.

### Required Setbacks

Stream setback requirements have been developed on the basis of an extensive literature review of applicable research from both local and national sources (**Table 6-6**) and in consultation with the Wildlife Agencies. Scientific studies to determine minimum setbacks typically recommend relatively modest setbacks (an average of 58 feet) to protect water quality (e.g., sediment and nutrient loading). Recommended setbacks to enhance stream ecology were greater and ranged from 85 to 220 feet with an average of 132 feet. Setbacks intended to provide protection for plants and wildlife were the greatest and ranged from 30 to 1,600 feet, with an average range of 335 to 410 feet (**Table 6-6**).

Working from scientifically rigorous definitions of appropriate setbacks, further refinement of setbacks was coordinated with the Local Partners to determine setback widths that, while consistent with the literature, limited the number of situations in which the setback would create undue hardship upon property owners or be infeasible to implement on a consistent basis (the setback would

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<sup>17</sup> The urban service area was used instead of the planning limit of urban growth because the urban service area represents the current boundary of urban development, not the future boundary after implementation of all covered activities. The Local Partners felt strongly that stricter riparian setbacks should be applied outside the urban service area to maximize protection of stream and riparian areas prior to urbanization of these areas.

create a large number of property exemptions). As such, the setbacks identified for this Plan (35 to 250 feet) balance the need to protect ecological functions with surrounding land uses and private property constraints.

A stream setback, measured from top of the stream bank, will be applied to all covered activities as shown in **Table 6-7**. To facilitate implementation of this condition, required setbacks are described below based on project location. **Figures 6-3a through 6-3d** illustrate different applications of the setback.

### **Inside the Urban Service Area**

Inside the urban service area at the time of Plan adoption, the setback for Category 1 streams is 100 feet (**Figure 6-3b**). The setback is increased by 50 feet for parcels with slopes greater than 30% to compensate for increased slope instability and higher anticipated rates of erosion. In addition, if the site supports riparian vegetation the setback is equal to either the riparian edge plus a 35 foot buffer or the setback as defined above, whichever is greater.

The setback for all Category 2 streams is 35 feet regardless of location or slope (see **Figure 6-3c**). In addition, if the site supports riparian vegetation, the setback is extended to include the riparian edge plus a 35-foot buffer. The 35-foot buffer is based on a minimum setback distance of 33 feet suggested for sediment and nutrient reduction (Corley et al. 1999). Ephemeral streams, while constituting the majority of streams affected by this condition, are not commonly mapped due to inherent difficulties in mapping ephemeral tributaries in the study area. Unmapped ephemeral streams will only be subject to the required setback if the criteria for defining a watercourse discussed under *Framework* are met for hydrologic connectivity, channel form, and topographic position (Santa Clara Valley Water Resources Protection Collaborative 2006). The applicable local jurisdiction is responsible for making determinations of whether a watercourse qualifies as a Category 2 stream and for implementing setbacks. Each local jurisdiction may also choose to extend the setback beyond 35 feet in cases where site-specific slope and geological characteristics warrant increased protection.

If the project proponent complies with the stream setback when implementing covered activities (i.e., the project avoids the setback), the area of the setback will be excluded from the development fee calculation for the project. The project will be tracked as the parcel or development area excluding the avoided setback so that local jurisdictions are able to identify new impacts in future project applications.

### **Outside the Urban Service Area**

Outside of the urban service area, setback requirements are greater. For Category 1 streams the setback distance is 150 feet (see **Figure 6-3d**). The setback is increased by 50 feet for slopes greater than 30% to compensate for increased slope instability and higher anticipated rates of erosion (**Figure 6-3a**). In addition, if the site supports riparian vegetation, the setback is either the riparian edge plus a 35-foot buffer or the setback described above, whichever is greater.

As described above for required setbacks “*Inside the Urban Service Area*,” the setback for all Category 2 streams is 35 feet regardless of location or slope (**Figure 6-3c**). If the site supports riparian vegetation, the setback will extend from the riparian edge plus a 35-foot buffer.

Unless a covered activity meets the “Exemption” criteria or is granted a stream setback exception, as described below, implementation of covered activities is prohibited within the stream setback.

Project proponents of projects located outside the urban service area must ensure that the development area does not encroach into the stream setback unless an exemption or an exception is applied. Projects or portions of projects that qualify for an exemption or exception are described below.

If a project proponent chooses to offer a conservation easement onstream setback areas, and the Implementing Entity and Wildlife Agencies approve, the contribution of the area placed under conservation easement may offset development fees as described below under *Fees and Conservation Easements*, and the land will become part of the Reserve System and contribute to the Plan’s requirements for riparian preservation (**Table 5-13**).

## Exemptions

The exemptions below apply regardless of location. If a covered activity qualifies for an exemption, a stream setback is not applied and the project proponent is not required to comply with this condition. However, other conditions may still apply and the project is still required to pay all applicable fees (e.g., land cover fee, wetland fee) as described in Chapter 9. Exemptions from the stream setback include the following.

1. Any activity that is not a covered activity and not subject to the Habitat Plan or its conditions.
2. Activities listed as exempt in Section 6.2.
3. Development on parcels less than 0.5 acre.
4. Covered activities that require work within or adjacent to streams such as bridges, levee maintenance and repair, flood-protection projects, stream maintenance, outfall installation and maintenance, flood-protection capital projects, dam-related capital projects.
5. Recreational trails (see Condition 4 and 9 for details on trail siting).
6. Replacement of utilities that result in no new permanent disturbance to the riparian corridor during construction and operation and generate only temporary loss of habitat. (This exemption does not apply for utility projects that result in new permanent riparian impacts.)
7. Stream crossings essential to provide a means of access to parcel or facility.

## Exceptions

Stream setback policies that apply to a large number of parcels with varying characteristics require a clear and practical set of exceptions. The term exception means an allowance for reductions in mandated setback distances necessary to allow reasonable use and development of a property based on the variety of constraints and factors that may affect the property. In situations where exceptions are granted, portions of this stream setback condition may still apply. Exceptions will be used in a minority of cases with special circumstances that limit or restrict the ability of a landowner to fully apply the stream setback. For example, geologic and seismic hazards, unusual lot size or configurations, unusual slope, or grading and access issues may present site constraints that require exceptions to the stream setback condition in order to allow reasonable development of a site consistent with local land use regulations.

For all proposed exceptions to the stream setbacks (inside or outside the urban service area), exceptions will be considered based on the following factors:

1. The existence of legal uses within the setback.
2. The extent to which meeting the required setback would result in a demonstrable hardship (i.e., denies an owner any economically viable use of his land or adversely affects recognized real property interests) for the applicant.
3. The extent to which meeting the required setback would require deviation from, exceptions to, or variances from other established policies, ordinances or standards regarding grading, access, water supply, wastewater treatment, disposal systems, geologic hazards, zoning, or other established code standards.
4. The stream setback exception does not preclude achieving the biological goals and objectives of the Habitat Plan or conflict with other applicable requirements of the Habitat Plan and local policies.

Regardless of project location, stream setback exceptions may not reduce a Category 1 stream setback to less than a distance of 50 feet for new development or 35 feet for existing or previously developed sites with legal buildings and uses (**Figure 6-3b**). All applicable fees must be paid for areas granted an exception.

Exceptions may be requested through the standard application process described in Section 6.8, or through a separate request process. Applicants must apply for a stream-setback exception through their local jurisdiction. All private applications for stream-setback exceptions must be reviewed and approved by the local jurisdiction. For projects implemented by a local jurisdiction, exception requests must be made to the Implementing Entity. The findings required to approve the stream setback exception must be supported by factual information and judgments in the record.

As part of the review process, the local jurisdiction or the Implementing Entity must consider the implications of a reduced setback on the riparian system and



covered species, progress toward the biological goals and objective of the Plan, and potential effects on adjacent properties. The local jurisdiction or the Implementing Entity must make written findings that document these considerations and the rationale for the stream-setback exception (see below for specific required findings). The local jurisdiction or the Implementing Entity may require technical reports from qualified professionals or consultants to support the application or request. For example, for any significant proposed reduction, a report by a qualified biologist, stream hydrologist, registered engineer, or other professional may be required as a basis for making necessary findings. Please see Section 6.8.5 for definition of a “qualified biologist.”

If the stream setback exception is granted at an administrative level (Zoning Administrator) or by a designated decision-making authority (Planning Commission), local agencies must include provisions that allow appeal of this decision to the elected legislative body of the applicable agency. Applicable fees may be imposed by the legislative body for processing such appeals, as well as for the original exception requests.

Prior to granting the exception, the local jurisdiction will provide the exception request and proposed decision to both the Implementing Entity and the Wildlife Agencies for review and comment. The Implementing Entity and Wildlife Agencies will have 30 days to review the request and provide a written response. A local agency cannot take an action until after that 30 day-period. The Implementing Entity will compile a list of all exceptions granted each calendar year for inclusion in the annual report to the Wildlife Agencies.

## **Fees and Conservation Easements**

If the stream setback is precluded from future development by a permanent conservation easement offered voluntarily by the landowner, and the easement is acceptable to the Implementing Entity and Wildlife Agencies and consistent with the Plan Reserve System (as described in Chapter 8, Section 8.6.3), a portion of the land cover fee for the covered activity (i.e., the fee for impacts to land cover types outside of the setback) may be waived by the Implementing Entity. If the value of the easement, in terms of area and resource value, exceeds the fee, credit cannot be “banked” for other projects (i.e., the Implementing Entity will not compensate for excess credit). Partial fee waivers for setbacks will be determined on a case-by-case basis by the Implementing Entity according to the criteria in Chapter 9, Section 9.4.1, subheading *Land Provided in Lieu of Development Fee*.

Each local jurisdiction may also consider imposing a conservation easement as a requirement for development approval when there is a direct nexus between the effects or impacts of a project and the need for an easement. The Implementing Entity will provide technical assistance to the local jurisdiction to determine whether a conservation easement is warranted. An easement must also demonstrate rough proportionality with the impact of the project.

## Condition 12. Wetland and Pond Avoidance and Minimization

The purpose of this condition is to minimize direct and indirect impacts to wetlands and ponds and in some cases, avoid direct and indirect impacts to high quality wetlands and ponds. Direct impacts are those that directly affect a wetland or a pond within its mapped boundary (see Section 6.8.4 *Item 4: Map of Wetlands and Waters* for a description of mapping direct impacts to wetlands). Project proponents are required to pay a wetland fee for impacts to wetlands and ponds to cover the cost of restoration or creation of aquatic land cover types required by this Plan (see Chapter 9 for details on this wetland fee). Covered activities can avoid paying the wetland fee if they avoid impacts to the wetland.

All project proponents will implement the following actions to avoid and minimize impacts of covered activities on wetlands and ponds.

### Planning Actions

- Projects must be designed to avoid and minimize impacts to wetlands to the maximum extent practicable.
- Applicants with streams on site must follow the stream setback requirements in Condition 11.
- Applicants for coverage under the Plan must follow the requirements and guidelines in Condition 3 to minimize the effects of development on downstream hydrology, streams, and wetlands.

### Design

- Locate septic facilities, if used, at least 100 feet from the edge of a wetland or pond if space allows.
- If the runoff from the development will flow within 100 feet of a wetland or pond, install vegetated stormwater filtration features, such as rain gardens, grass swales, tree box filters, or infiltration basins, to capture and treat flows.
- Plant native vegetation (shrubs and small trees) between the wetland or pond and the development such that the line of sight between the wetland or pond and the development is shielded.
- If during the environmental review process it is shown that a project has adverse indirect impacts to the wetland's function (change in hydrological functions, etc.), the project will be required to avoid these indirect effects, as determined on a case-by-case approach by the local jurisdiction, in consultation with the Implementing Entity. If a Local Partner is carrying out the activity, it will coordinate avoidance measures with the Implementing Entity. Wetlands that are not completely avoided, including indirect effects, will be considered permanently impacted and will count towards the impact

caps described in **Table 4-2** and will be assessed fees as described in Chapter 9. If however, the local jurisdiction demonstrates to the Wildlife Agencies that the wetlands to be indirectly affected are highly degraded prior to project impacts, and the Wildlife Agencies agree, impacts will not be counted toward the impact caps described in **Table 4-2** and fees will not be assessed. “Highly degraded” wetlands could include, but are not limited to, those that are indirectly affected by surrounding development or agriculture to the extent that hydrology, water quality, or habitat for covered species is adversely affected.

## Construction Actions

- Personnel conducting ground-disturbing activities in or adjacent to wetlands and ponds will be trained by a qualified biologist in these avoidance and minimization measures and the permit obligations of project proponents working under this Plan.
- All wetlands and ponds to be avoided by covered activities will be temporarily staked in the field by a qualified biologist to ensure that construction equipment and personnel avoid these features.
- Fencing will be erected along the outer edge of the project area, between the project area and a wetland or pond. The type of fencing will match the activity and impact types. For example, projects that have the potential to cause erosion will require erosion control barriers (see below), and projects that may bring more household pets to a site will be fenced to exclude pets. The temporal requirements for fencing also depend on the activity and impact type. For example, fencing for permanent impacts will be permanent, and fencing for short-term impacts will be removed after the activity is completed.
- Appropriate erosion control measures (e.g., fiber rolls, filter fences, vegetative buffer strips) will be used on site to reduce siltation and runoff of contaminants into wetlands, ponds, streams, or riparian woodland/scrub. Filter fences and mesh will be of material that will not entrap reptiles and amphibians. Erosion control blankets will be used as a last resort because of their tendency to biodegrade slowly and trap reptiles and amphibians.
- Erosion-control measures will be placed between the wetland or pond and the outer edge of the project site.
- Fiber rolls used for erosion control will be certified as free of noxious weed seed.
- Seed mixtures applied for erosion control will not contain invasive nonnative species, but will rather be composed of native species appropriate for the site or sterile nonnative species. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives.

- Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas.
- Trash generated by covered activities will be promptly and properly removed from the site.
- No construction or maintenance vehicles will be refueled within 200 feet of avoided wetlands and ponds unless a bermed and lined refueling area is constructed and hazardous material absorbent pads are available in the event of a spill.
- All management of pest species will be conducted in compliance with the County integrated pest management (IPM) ordinance. In addition, other requirements identified in this chapter that exceed the requirements of the IPM ordinance will be implemented.
- Where appropriate to control serious invasive plants, herbicides that have been approved by EPA for use in or adjacent to aquatic habitats may be used as long as label instructions are followed and applications avoid or minimize impacts on covered species and their habitats. In wetland environments, appropriate herbicides may be applied during the dry season to control nonnative invasive species (e.g., yellow star-thistle). Herbicide drift will be minimized by applying the herbicide as close to the target area as possible. Herbicides will only be applied by certified personnel in accordance with label instructions.
- All organic matter should be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with ponds, wetlands, or potentially contaminated sediments. Items should be rinsed with clean water before leaving each study site (U.S. Fish and Wildlife Service 2005).
- Implement measures to minimize the spread of disease and non-native species based on current Wildlife Agency protocols (e.g., *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog: Appendix B, Recommended Equipment Decontamination Procedures* [U.S. Fish and Wildlife Service 2005]) and other best available science.
- Used cleaning materials (liquids, etc.) should be disposed of safely, and if necessary, taken off site for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags (U.S. Fish and Wildlife Service 2005).
- Portions of the project that occur in streams will comply with Condition 4.

### **Condition 13. Serpentine and Associated Covered Species Avoidance and Minimization**

Serpentine soils comprise four land cover types in the study area: serpentine bunchgrass grassland, serpentine rock outcrops, serpentine seeps, and serpentine chaparral. These land cover types are estimated to encompass 14,314 acres in the study area. Additional unmapped areas of serpentine may be discovered during

implementation because it often occurs in small patches that could not be discerned at the scale of the mapping and available data.

Most of the serpentine areas in the study area are expected to be acquired as part of the Reserve System (see Chapter 5 for specific targets). However, some impacts on these land cover types may still occur (e.g., allowable impacts to serpentine bunchgrass grassland are limited to 550 acres [**Table 4-2**]). Because of the high importance and rarity of serpentine soils and their habitats, these areas will be avoided whenever feasible during project planning.

In cases where serpentine areas are part of a project site in a developed area, the project will be designed to preserve larger patches of serpentine outside the development area and limit impacts to the smallest patches feasible and to the edges of serpentine patches regardless of their size. The length of the edge of the serpentine patch that is directly adjacent to the developed area will be minimized and will include as large a buffer as possible between the serpentine edge and the developed area. Landscaping will not be planted on serpentine areas except as needed to reduce fire hazards adjacent to structures consistent with County fire hazard reduction regulations (see also Condition 10). Plantings will not include species that are known or suspected to invade serpentine habitats or cross-pollinate with endemic serpentine plant species or other native plants.

On undeveloped sites, the project area and construction staging area must be located to avoid or minimize impacts to any serpentine on site. The guidelines described above for developed areas will also be followed for project sites in undeveloped areas.

Where mapped serpentine cannot be avoided, the minimization measures listed below will be implemented.

- Conduct surveys of the serpentine vegetation to inventory for covered species and evaluate habitat quality for covered species.
- For portions of the development area that are in Bay checkerspot butterfly habitat units identified in Appendix D, survey the site for the presence of larval host plants of Bay checkerspot butterfly. If larval host plants are found, conduct reconnaissance level surveys for adult butterflies during the peak of the flight period to determine species presence or absence.
- Locate the project footprint as far from the covered species or the highest-quality serpentine habitat as is feasible. Utilize applicable buffers as identified in this chapter.
- If covered plants occur on the site and cannot be avoided, notify the Implementing Entity of the construction schedule so that plant salvage can be considered and potentially implemented (see Condition 19).

## **Condition 14. Valley Oak and Blue Oak Woodland Avoidance and Minimization**

Valley oak woodland and blue oak woodland are considered by CDFG to be sensitive biotic communities (California Department of Fish and Game 2003). There is evidence that valley oak woodland was once one of the dominant land cover types on the floor of the Santa Clara Valley, but it has been largely removed by urban and agricultural development (San Francisco Estuary Institute 2006, 2008). These communities can provide important foraging or movement habitat for species covered by the Plan—California red-legged frog, and California tiger salamander—as well as for many other native species. For these reasons, these two oak woodland land cover types would benefit from some avoidance and minimization associated with covered activities.

All covered activities will implement the following actions to avoid or minimize impacts on valley and blue oak woodland.

### **Project Planning**

- Projects on sites supporting substantial stands of valley oak woodland or blue oak woodland will minimize their impacts on these communities and preserve these stands on site when to do so would further the biological goals and objectives of the Plan. For example, projects should preserve oak woodland communities that are adjacent to existing stands of protected oak woodlands to avoid habitat fragmentation and degradation of wildlife linkages.
- Projects will avoid to the maximum extent feasible irrigating in and around valley oak woodland and will avoid altering hydrology of the site, including location of septic leach fields, such that valley oak woodland receives more water than under pre-project conditions.
- Large and healthy trees will be maintained on site whenever feasible. Local jurisdictions may set tree size thresholds for preservation that are consistent with local tree ordinances. Large valley oak trees still healthy today are clearly visible on air photos from as far back as 1939 (San Francisco Estuary Institute 2006), even though they are surrounded by agricultural fields or urban development. Preserved trees can provide habitat value for many decades; they also provide a significant community amenity.
- If trees are maintained on a site, buffer zones will be established between preserved valley oak or blue oak trees and development at a distance equal to or greater than the root protection zone, which is defined as a buffer zone determined by calculating one foot for each inch of trunk diameter measured at 4.5 feet above ground surface (Matheny and Clark 1998).

## Project Construction

- Temporary project access points will be constructed as close as possible to the work area to minimize necessity for tree removal.
- Roads and pathways will be aligned outside of the tree's root protection zone (as defined above) whenever possible.
- Roads and pathways designed beneath or within 25 feet of the dripline of oak trees will be graded using hand-held equipment and will use permeable surfacing (e.g., grass pavers that allow runoff to infiltrate the ground).
- Alteration of natural grade through fill or other means within the root protection zone of oak trees will be minimized.
- Trenching for utility lines and other purposes will be minimized within root protection zones. Utilities may be installed in these areas by boring below the root zone.
- If extensive pruning of blue oaks and valley oaks is necessary, pruning will be conducted during the winter dormant period for these species and under the supervision of an arborist certified to International Society of Arboriculture or similar standards.

## 6.6 Conditions to Minimize Impacts on Specific Covered Species

Species-specific conditions are presented below. The timing of species habitat surveys, preconstruction surveys, and construction monitoring relative to impacts are described below and summarized in **Table 6-8**. For long term projects and projects that are phased<sup>18</sup>, the frequency and timing of surveys relative to impacts will be determined by the local jurisdiction or Implementing Entity in coordination with the Wildlife Agencies on a case-by-case basis. At a minimum, surveys and monitoring (if required) will be done prior to each construction phase if the entire project area is not continuously disturbed between phases.

The Implementing Entity will maintain and update modeled habitat maps based on guidance provided in Chapter 7, *Monitoring and Adaptive Management Program*. For species that require surveys based on modeled habitat<sup>19</sup>, qualified biologists will utilize the most current modeled habitat maps available from the Implementing Entity to guide where surveys must be conducted. Surveys will be conducted based on modeled habitat maps that are updated throughout Plan implementation. Similarly, the Implementing Entity will track impacts to modeled habitat based on modeled habitat maps updated during Plan implementation.

<sup>18</sup> Phasing may include planned phasing of construction (e.g., multi-year phasing of a road construction project), or unplanned gaps in construction activity.

<sup>19</sup> San Joaquin kit fox, western burrowing owl, and Bay checkerspot butterfly.

## 6.6.1 Selected Covered Wildlife Species

Conditions 15–18 identify conditions on covered activities that are specific to some of the covered species. Activities that may affect these covered species must also adhere to other applicable conditions in this chapter, including Condition 1, *Avoid Direct Impacts on Legally Protected Plant and Wildlife Species*. A summary of species surveys, preconstruction surveys, and construction monitoring requirements is provided in **Table 6-8**.

### Condition 15. Western Burrowing Owl

To avoid or minimize direct impacts of covered activities on western burrowing owls, the procedures described below will be implemented. This condition incorporates survey, avoidance, and minimization guidelines from the following western burrowing owl conservation plans and other sources pertaining to the study area. The avoidance and minimization process for western burrowing owl as required in this condition is illustrated in **Figure 6-4**.

- *CDFG Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 1995).
- *CDFG Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012).
- *Draft Burrowing Owl Habitat Conservation Strategy and Implementation Plan* (City of San José 2000).
- *City of Morgan Hill—Citywide Burrowing Owl Habitat Mitigation Plan* (City of Morgan Hill 2003).
- Personal communication with Jack Barclay regarding ongoing monitoring efforts in the study area including annual monitoring at San José International Airport.
- Various unpublished reports from survey efforts in the study area.
- Guidance from CDFG.

### Western Burrowing Owl Habitat Survey

Western burrowing owl habitat surveys will be required in the study area in all modeled occupied nesting habitat (see **Figure 5-11**). Surveys are not required in sites that are mapped as potential burrowing owl nesting or only overwintering habitat. Modeled habitat types may change throughout the permit term based on the best available scientific data. For example, the Implementing Entity will be conducting annual surveys or collecting annual survey data of other organizations in occupied nesting habitat throughout the permit area to determine the annual status of known nesting areas the number of adult breeding owls present. The Implementing Entity will also coordinate with other South Bay local



governments, special districts, and non-profit organizations every 3 years to assess status of the burrowing owl population in the entire study area and the expanded study area for burrowing owl conservation, outside areas of modeled occupied habitat.

Habitat surveys in occupied nesting habitat are required in both breeding and non-breeding seasons. If the project site falls within occupied nesting habitat, a qualified biologist will map areas with burrows (i.e., areas of highest likelihood of burrowing owl activity) and all burrows that may be occupied (as indicated by tracks, feathers, egg shell fragments, pellets, prey remains, or excrement) on the project site. This mapping will be conducted while walking transects throughout the entire project footprint, plus all accessible areas within a 250-foot radius from the project footprint. The centerline of these transects will be no more than 50 feet apart and will vary in width to account for changes in terrain and vegetation that can preclude complete visual coverage of the area. For example, in hilly terrain with patches of tall grass, transects will be closer together, while in open areas with little vegetation they can be 50 feet apart.

This methodology is consistent with other accepted survey protocols for this species (California Burrowing Owl Consortium 1993). The Implementing Entity may update this protocol during the permit term based on changes to the accepted protocol with the concurrence of the Wildlife Agencies. Adjacent parcels under different land ownership will be surveyed only if access is granted or if the parcels are visible from authorized areas.

If suitable habitat is identified during the habitat survey, and if the project does not fully avoid impacts to the suitable habitat, preconstruction surveys will be required. Suitable habitat is fully avoided if the project footprint does not impinge on a 250-foot buffer around the suitable burrow.

## **Preconstruction Survey**

Prior to any ground disturbance related to covered activities, a qualified biologist will conduct preconstruction surveys in all suitable habitat areas as identified during habitat surveys. The purpose of the preconstruction surveys is to document the presence or absence of burrowing owls on the project site, particularly in areas within 250 feet of construction activity.

To maximize the likelihood of detecting owls, the preconstruction survey will last a minimum of three hours. The survey will begin 1 hour before sunrise and continue until 2 hours after sunrise (3 hours total) or begin 2 hours before sunset and continue until 1 hour after sunset. Additional time may be required for large project sites. A minimum of two surveys will be conducted (if owls are detected on the first survey, a second survey is not needed). All owls observed will be counted and their location will be mapped.

Surveys will conclude no more than 2 calendar days prior to construction. Therefore, the project proponent must begin surveys no more than 4 days prior to

construction (2 days of surveying plus up to 2 days between surveys and construction). To avoid last minute changes in schedule or contracting that may occur if burrowing owls are found, the project proponent may also conduct a preliminary survey up to 14 days before construction. This preliminary survey may count as the first of the two required surveys as long as the second survey concludes no more than 2 calendar days in advance of construction.

## **Implementation of Covered Activities in Burrowing Owl Habitat**

In order to allow covered activities to go forward in burrowing owl habitat prior to the formal take authorization of individuals described above, project applicants will employ avoidance measures described below to ensure that direct take does not occur. Application of these measures is illustrated in **Figure 6-4**. The below avoidance measures apply to all projects that affect any burrowing owl habitat, regardless of whether surveys are required by this condition. In other words, if a project is occurring outside of modeled occupied nesting habitat, the project proponent is obligated to ensure avoidance and minimization of impact to burrowing owls according to the measures described below.

## **Avoidance Measures**

### **Breeding Season**

If evidence of western burrowing owls is found during the breeding season (February 1–August 31), the project proponent will avoid all nest sites that could be disturbed by project construction during the remainder of the breeding season or while the nest is occupied by adults or young (occupation includes individuals or family groups foraging on or near the site following fledging). Avoidance will include establishment of a 250-foot non-disturbance buffer zone around nests. Construction may occur outside of the 250-foot non-disturbance buffer zone. Construction may occur inside of the 250-foot non-disturbance buffer during the breeding season if:

- the nest is not disturbed, and
- the project proponent develops an avoidance, minimization, and monitoring plan that will be reviewed by the Implementing Entity and the Wildlife Agencies prior to project construction based on the following criteria.
  - The Implementing Entity and the Wildlife Agencies approves of the avoidance and minimization plan provided by the project applicant.
  - A qualified biologist monitors the owls for at least 3 days prior to construction to determine baseline nesting and foraging behavior (i.e., behavior without construction).
  - The same qualified biologist monitors the owls during construction and finds no change in owl nesting and foraging behavior in response to construction activities.

- ❑ If there is any change in owl nesting and foraging behavior as a result of construction activities, these activities will cease within the 250-foot buffer. Construction cannot resume within the 250-foot buffer until the adults and juveniles from the occupied burrows have moved out of the project site.
- ❑ If monitoring indicates that the nest is abandoned prior to the end of nesting season and the burrow is no longer in use by owls, the non-disturbance buffer zone may be removed. The biologist will excavate the burrow to prevent reoccupation after receiving approval from the Wildlife Agencies.

The Implementing Entity and the Wildlife Agencies have 21 calendar days to respond to a request from the project proponent to review the proposed construction monitoring plan. If these parties do not respond within 21 calendar days, it will be presumed that they concur with the proposal and work can commence.

### **Non-Breeding Season**

During the non-breeding season (September 1–January 31), the project proponent will establish a 250-foot non-disturbance buffer around occupied burrows as determined by a qualified biologist. Construction activities outside of this 250-foot buffer are allowed. Construction activities within the non-disturbance buffer are allowed if the following criteria are met in order to prevent owls from abandoning important overwintering sites.

- A qualified biologist monitors the owls for at least 3 days prior to construction to determine baseline foraging behavior (i.e., behavior without construction).
- The same qualified biologist monitors the owls during construction and finds no change in owl foraging behavior in response to construction activities.
- If there is any change in owl nesting and foraging behavior as a result of construction activities, these activities will cease within the 250-foot buffer.
- If the owls are gone for at least one week, the project proponent may request approval from the Implementing Entity that a qualified biologist excavate usable burrows to prevent owls from re-occupying the site. After all usable burrows are excavated, the buffer zone will be removed and construction may continue.

Monitoring must continue as described above for the non-breeding season as long as the burrow remains active.

### **Construction Monitoring**

Based on the avoidance, minimization, and monitoring plan developed (as required in the above section), during construction, the non-disturbance buffer zones will be established and maintained if applicable. A qualified biologist will

monitor the site consistent with the requirements described above to ensure that buffers are enforced and owls are not disturbed. The biological monitor will also conduct training of construction personnel on the avoidance procedures, buffer zones, and protocols in the event that a burrowing owl flies into an active construction zone.

## **Passive Relocation**

Passive relocation would not be allowed under the Plan until the positive growth trend described in Section 5.4.6 is achieved. Once this occurs, passive owl relocation may be allowed, with the approval of the Wildlife Agencies, on project sites in the non-breeding season (September 1–January 31) if the other measures described in this condition do not allow work to continue. Passive relocation would only be proposed if the burrow needed to be removed, or had the potential of collapsing (e.g., from construction activities), as a result of the covered activity.

If passive relocation is eventually allowed, a qualified biologist can passively exclude birds from their burrows during non-breeding season only by installing one-way doors in burrow entrances. These doors will be in place for 48 hours to ensure owls have left the burrow, and then the biologist will excavate the burrow to prevent reoccupation. Burrows will be excavated using hand tools. During excavation an escape route will be maintained at all times. This may include inserting an artificial structure into the burrow to avoid having the overburden collapse into the burrow and trapping owls inside. Other methods of passive relocation, based on best available science, may be approved by the Wildlife Agencies during Plan implementation.

### **Exceptions to Passive Relocation Prohibition**

Due to the relatively low numbers of burrowing owls in the study area, it is not expected that the prohibition of passive relocation will result in project delays. However, it is possible that a covered activity could not proceed due to avoidance measures for burrowing owl in this condition if owls continually persist on a site where avoidance is not feasible. In such cases, a project proponent may apply for an exception based on the following process. For this condition, the term exception means an allowance to conduct passive relocation of burrowing owls during the non-breeding season only when this activity is not otherwise allowed. This exception process is necessary to allow reasonable use and development of a property based on the variety of constraints and factors that may affect the property. In situations where exceptions are granted, other portions of this condition may still apply. Exceptions will be used in a minority of cases with special circumstances that limit or restrict the ability of a landowner to fully apply the condition.

Exceptions may be requested through the standard application process described in Section 6.8, or through a separate request process. Private applicants must apply for a passive relocation exception through their local jurisdiction. Project

proponents must develop and submit with the request for exception a passive relocation plan. The passive relocation plan must document the following.

1. That owls have occupied the site for a full year without relocating voluntarily. Surveys documenting presence must be completed by a qualified biologist and results must be provided in a written report. The report should confirm that one or more individuals (i.e., unique owl[s]) were monitored for a year and that the owl(s) had used the site for a full year<sup>20</sup>.
2. The proposed process for relocation, including schedule for the proposed passive relocation and name of the qualified biologist.

The local jurisdiction, the Implementing Entity, and the Wildlife Agencies will meet to discuss the proposed passive relocation plan. Exceptions will be considered based on, but not limited to, the following factors:

1. The parcel is equal to or less than 3 acres and is more than 1,000 feet from other suitable nesting or foraging habitat such that it is unlikely the site can sustain burrowing owls into the future.
2. If the site has historically been used for nesting (within the last 3 years).
3. If the site is a target for a burrowing owl temporary or permanent management agreement.

As part of the review process, the Implementing Entity and Wildlife Agencies will consider the implications of an exception on the burrowing owl population and progress toward the biological goals and objective of the Plan. A passive relocation exception will not be granted if the Implementing Entity and Wildlife Agencies determine that such an exception, as mitigated, would preclude implementation of the conservation strategy of the Habitat Plan or conflict with other applicable requirements of the Habitat Plan and local policies. The local jurisdiction or the Implementing Entity must make written findings that document these considerations and the rationale for the exception.

Additional mitigation may be required as part of an approval to implement passive relocation that is otherwise prohibited by the Plan. The need for and form of additional mitigation will be determined and approved by the Implementing Entity and Wildlife Agencies. Additional mitigation could include payment of additional fees, or contribution of occupied lands to the Reserve System. Applicable fees may be imposed by the local jurisdiction for processing exception requests. Mitigation will be proportional to the impact occurring as a result of a specific eviction and will fully mitigate such evictions.

The Implementing Entity will compile a list of all exceptions granted each calendar year for inclusion in the annual report to the Wildlife Agencies.

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<sup>20</sup> If monitoring reveals that an owl(s) has vacated the site for 10 consecutive days or more, the project applicant may assume that the owl has voluntarily relocated and a qualified biologist may take measures to collapse suitable habitat to discourage new owls from occupying the site.

## Condition 16. Least Bell's Vireo

To avoid and minimize direct impacts of covered activities on least Bell's vireos, the following procedures will be implemented. These survey requirements provide compliance with the Plan and the MBTA (least Bell's vireo is a listed species, so the HCP permit also serves as a Special Purpose Permit under MBTA; see Chapter 1 for details).

### Habitat Survey

Least Bell's vireo surveys will only be required for projects occurring within potential breeding habitat. The Implementing Entity will provide maps showing the geographic regions where surveys may be required. These maps will be updated during the permit term to incorporate best available science on where this species may be found. At the time of Plan adoption, the area of required surveys is limited to the Pajaro watershed, including Uvas, Llagas, and Pacheco sub-watersheds.

Projects occurring within the mapped area require surveys if the project-specific verified land cover map (see Section 6.8.3 *Item 3: Land Cover Types on Site*) shows that the project area is within 250 feet of riparian land cover types. If a project meets this criterion, a qualified biologist will conduct a field investigation to identify and map early successional riparian vegetation (typically dominated by willow shrubs and other thick understory vegetation) which may be used for nesting. If early successional riparian vegetation is found, the project proponent may revise the proposed project to avoid all areas within a 250-foot buffer around the potential nesting habitat and surveys will be concluded.

### Preconstruction Survey

If the project proponent chooses not to avoid the potential nesting site and the 250-foot buffer, additional nesting surveys are required. Prior to any ground disturbance related to covered activities, a qualified biologist will:

1. Make his/her best effort to determine if there has been nesting at the site in the past 3 years. This includes checking the CNDDB, contacting local experts, and looking for evidence of historical nesting (i.e., old nests).
2. If no nesting in the past 3 years is evident, conduct a preconstruction survey in areas identified in the habitat survey as supporting potential least Bell's vireo nesting habitat. Surveys will be made at the appropriate times of year when nesting use is expected to occur. The surveys will document the presence or absence of nesting pairs of least Bell's vireo. Protocol-level surveys will be used (USFWS's 2001 least Bell's vireo survey guidelines or latest protocol). Surveys will conclude no more than two calendar days prior to construction.

To avoid last minute changes in schedule or contracting that may occur if an active nest is found, the project proponent may also conduct a preliminary survey up to 14 days before construction. If one or more least Bell's vireo nests are found present (through step 1 or 2 above), the nest site(s) plus a 250-foot buffer will be avoided (see below for additional avoidance and minimization details). The Wildlife Agencies will be notified immediately of nest locations.

## **Avoidance and Minimization**

Covered activities must avoid active least Bell's vireo nests during the breeding season (March 15–July 31) by maintaining at least a 250-foot no-activity buffer around all active nests. As long as the nest remains active, no activity will occur within the established buffer. Disturbance to previous nesting sites (for up to 3 years) will also be avoided during the breeding season unless the disturbance is required for the conservation strategy or to maintain public safety. Least Bell's vireos use previous nesting sites, and disturbance during the breeding season may preclude birds from using existing nests.

The required buffer may be reduced in areas where there are sufficient barriers or topographic relief to protect the nest from excessive noise or other disturbance. Implementing Entity technical staff will coordinate with the Wildlife Agencies and evaluate exceptions to the minimum no-activity buffer distance on a case-by-case basis.

## **Construction Monitoring**

If occupied nests are identified, a qualified biologist will monitor construction to ensure that the 250-foot no-activity buffer around all active least Bell's vireo nests is maintained to ensure that covered activities do not affect nest success. If monitoring indicates that construction outside of the buffer is affecting breeding, the buffer will be increased if space allows (e.g., move staging areas farther away). If space does not allow, construction will cease until the young have fledged from the nest or until the end of the breeding season, whichever occurs first. The biological monitor will also conduct training of construction personnel on the avoidance procedures, buffer zones, and protocols in the event that a least Bell's vireo flies into an active construction zone (i.e., outside the buffer zone).

## **Condition 17. Tricolored Blackbird**

To avoid direct impacts of covered activities on nesting tricolored blackbird colonies, the following procedures will be implemented.

## Habitat Survey

Projects require surveys if the project-specific verified land cover map (see Section 6.8.3 *Item 3: Land Cover Types on Site*) shows that the project area is within 250 feet of any riparian, coastal and valley freshwater marsh (perennial wetlands), or pond land cover types. If a project meets this criterion, a qualified biologist will conduct a field investigation to identify and map potential nesting substrate. Nesting substrate generally includes flooded, thorny, or spiny vegetation (e.g., cattails, bulrushes, willows, blackberries, thistles, or nettles). If potential nesting substrate is found, the project proponent may revise the proposed project to avoid all areas within a 250-foot buffer around the potential nesting habitat and surveys will be concluded.

## Preconstruction Survey

If the project proponent chooses not to avoid the potential nesting habitat and the 250-foot buffer, additional nesting surveys are required. Prior to any ground disturbance related to covered activities, a qualified biologist will:

1. Make his/her best effort to determine if there has been nesting at the site in the past 5 years. This includes checking the CNDDB, contacting local experts, and looking for evidence of historical nesting (i.e., old nests).
2. If no nesting in the past 5 years is evident, conduct a preconstruction survey in areas identified in the habitat survey as supporting potential tricolored blackbird nesting habitat. Surveys will be made at the appropriate times of year when nesting use is expected to occur. The surveys will document the presence or absence of nesting colonies of tricolored blackbird. Surveys will conclude no more than two calendar days prior to construction.

To avoid last minute changes in schedule or contracting that may occur if an active nest is found, the project proponent may also conduct a preliminary survey up to 14 days before construction. If a tricolored blackbird nesting colony is present (through step 1 or 2 above), a 250-foot buffer will be applied from the outer edge of all hydric vegetation associated with the site and the site plus buffer will be avoided (see below for additional avoidance and minimization details). The Wildlife Agencies will be notified immediately of nest locations.

## Avoidance and Minimization

Covered activities must avoid tricolored blackbird nesting habitat that is currently occupied or have been used in the past 5 years. If tricolored blackbird colonies are identified during the breeding season, covered activities will be prohibited within a 250-foot no-activity buffer zone around the outer edge of all hydric vegetation associated with the colony. This buffer may be reduced in areas with dense forest, buildings, or other habitat features between the construction activities and the active nest colony, or where there is sufficient topographic relief to protect the colony from excessive noise or visual disturbance.



Depending on site characteristics, the sensitivity of the colony, and surrounding land uses, the buffer zone may be increased. Land uses potentially affecting a colony will be observed by a qualified biologist to verify that the activity is not disrupting the colony. If it is, the buffer will be increased. Implementing Entity technical staff will coordinate with the Wildlife Agencies and evaluate exceptions to the minimum no-activity buffer distance on a case-by-case basis.

## Construction Monitoring

If construction takes place during the breeding season when an active colony is present, a qualified biologist will monitor construction to ensure that the 250-foot buffer zone is enforced. If monitoring indicates that construction outside of the buffer is affecting a breeding colony, the buffer will be increased if space allows (e.g., move staging areas farther away). If space does not allow, construction will cease until the colony abandons the site or until the end of the breeding season, whichever occurs first. The biological monitor will also conduct training of construction personnel on the avoidance procedures, buffer zones, and protocols in the event that tricolored blackbirds fly into an active construction zone (i.e., outside the buffer zone).

## Condition 18. San Joaquin Kit Fox

Disturbance of all San Joaquin kit fox dens will be avoided to the maximum extent possible. To avoid or minimize direct impacts of covered activities on San Joaquin kit fox, the following procedures will be implemented. This program was based on USFWS's *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011).

## Habitat Survey

San Joaquin kit fox surveys will only be required for projects occurring within modeled habitat (**Appendix D**). (This model will be updated as needed based on best available scientific information.) The Implementing Entity will provide updated modeled habitat maps to the County (the only jurisdiction in which these areas occur). A qualified biologist will conduct a field evaluation of suitable breeding or denning habitat for kit fox for all covered activities that occur within modeled habitat and map potential den sites. If the project does not fully avoid impacts on suitable dens, preconstruction surveys will be required. Suitable breeding habitat is fully avoided if the project footprint does not overlap with a suitable den or with a 250-foot buffer around the suitable den.

## Preconstruction Survey

Prior to any ground disturbance related to covered activities, a qualified biologist will conduct a preconstruction survey for covered activities in areas identified by species surveys as being suitable breeding or denning habitat. The surveys will evaluate use of dens by kit foxes using methods appropriate for the northern edge of the species' range, such as placing a tracking medium in the project area where suitable dens occur. Surveys will conclude no more than two calendar days prior to construction. To avoid last minute changes in schedule or contracting that may occur if a kit fox or active den is found, the project proponent may also conduct a preliminary survey up to 14 days before construction. On the parcel where the activity is proposed, the biologist will survey the proposed disturbance footprint and a 250-foot radius from the perimeter of the proposed footprint to identify San Joaquin kit foxes and/or suitable dens. Adjacent parcels under different land ownership will not be surveyed unless access is granted within the 250-foot radius. The status of all dens will be determined and mapped. Written results of preconstruction surveys will be submitted to USFWS and CDFG within two calendar days after survey completion and before the start of ground disturbance.

If San Joaquin kit foxes and/or suitable dens (i.e., dens greater than 5 inches in diameter) are identified in the survey area, the conditions described below will be implemented.

## Avoidance and Minimization

The goal of the avoidance and minimization measures for San Joaquin kit fox are to avoid all injury or death to kit fox in the study area, and to minimize harm or harassment to the species. No take authorization for injury or death to kit fox is provided by this Plan due to the rarity of the species in the study area. The following avoidance and minimization conditions will be applied to projects that do not fully avoid suitable dens or kit fox individuals.

- If a suitable San Joaquin kit fox den is discovered in the proposed development footprint, the den will be monitored for 3 days by a USFWS- and CDFG-approved biologist using a tracking medium or an infrared beam camera to determine if the den is currently being used.
- Unoccupied dens will be destroyed immediately to prevent subsequent use.
- If a natal or pupping den is found, USFWS and CDFG will be notified immediately. The den will not be destroyed until the pups and adults have vacated and then only after further consultation with USFWS and CDFG.
- If kit fox activity is observed at the den during the initial monitoring period, the den will be monitored for an additional 5 consecutive days from the time of the first observation to allow any resident animals to move to another den while den use is actively discouraged. For dens other than natal or pupping dens, use of the den can be discouraged by partially plugging the entrance with soil such that any resident animal can easily escape. Once the den is

determined to be unoccupied it may be excavated under the direction of the biologist. Alternatively, if the animal is still present after 5 or more consecutive days of plugging and monitoring, the den may have to be excavated by hand when, in the judgment of a biologist, it is temporarily vacant (i.e., during the animal's normal foraging activities). If at any point during excavation a kit fox is discovered inside the den, the excavation activity shall cease immediately and monitoring of the den as described above will be resumed. Destruction of the den may be completed when, in the judgment of the biologist, the animal has escaped from the partially destroyed den.

- Construction and on-going operational requirements from *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011) or the latest guidelines will be implemented.
- If active or suitable dens are identified within the proposed disturbance footprint or outside the proposed project footprint but within a 250-foot buffer, exclusion zones around each den entrance or cluster of entrances will be demarcated. The configuration of exclusion zones will be circular, with a radius measured outward from the den entrance(s). No covered activities will occur within the exclusion zones. Exclusion zone radii for atypical dens and suitable dens will be at least 50 feet and will be demarcated with four to five flagged stakes. Exclusion zone radii for known dens will be at least 100 feet and will be demarcated with staking and flagging that encircles each den or cluster of dens but does not prevent access to the den by the foxes.

## Construction Monitoring

If construction takes place while kit fox dens are occupied, a qualified biologist will be present to ensure compliance with the avoidance and minimization measures listed above. The frequency of monitoring will be approved by USFWS and CDFG and will be based on the frequency and intensity of construction activities and the likelihood of disturbance to the active dens. In most cases, monitoring will occur at least weekly, but in some cases daily monitoring may be appropriate to ensure that disturbance of San Joaquin kit fox is minimized.

### 6.6.2 Covered Plant Species

Impacts on covered plant occurrences are constrained by limits on the number of occurrences impacted, as described in Chapter 4 (see **Table 4-6**). Accordingly, only two additional conditions on covered activities is needed to meet regulatory requirements for covered plants.

## Condition 19. Plant Salvage when Impacts are Unavoidable

Where impacts on covered plant species cannot be avoided and plants will be removed by approved covered activities, the Implementing Entity has the option of salvaging the covered plants. Salvage of covered plants is conducted in addition to mitigation that may be required for impacts on covered plants.

Plant salvage as mitigation is acknowledged as a technique that rarely succeeds; it is opposed by conservation organizations as a primary mitigation tool (Howald 1996; California Native Plant Society 1998). Therefore, the Implementing Entity must carefully weigh the expected costs and potential benefits of the salvage effort before undertaking it. Salvage guidelines are presented below for all covered plants, for perennial species, and for annual species.

### All Covered Plants

All salvage operations will be conducted by the Implementing Entity or a third party contractor approved by the Implementing Entity. Translocation activities will be reviewed and approved by the Wildlife Agencies in advance of translocation activities occurring. Translocated plants should be moved during their dormant season in order to minimize impacts to individuals. To ensure enough time to plan salvage operations, project proponents will notify the Implementing Entity of their schedule for removing the covered plant occurrence.

The Implementing Entity may conduct investigations into the efficacy of salvaging seeds from the soil seed bank for both perennial and annual species. The soil seed bank may add to the genetic variability of the occurrence. Covered species may be separated from the soil through garden/greenhouse germination or other appropriate means. Some topsoil taken from impact sites may also be moved to the transplant site in the reserve to introduce soil microorganisms.

The Implementing Entity will transplant new occurrences such that they constitute separate populations and do not become part of an existing population of the species, as measured by the potential for genetic exchange among individuals through pollen or propagule (e.g., seed, fruit) dispersal. Transplanting or seeding *receptor* sites (i.e., habitat suitable for establishing a new population) will be carefully selected on the basis of physical, biological, and logistical considerations (Fiedler and Laven 1996); some examples of these are listed below.

- Historic range of the species.
- Soil type.
- Soil moisture.
- Topographic position, including slope and aspect.

- Site hydrology.
- Mycorrhizal associates.
- Presence or absence of typical associated plant species.
- Presence or absence of herbivores or plant competitors.
- Site accessibility for establishment, monitoring, and protection from trampling by cattle or trail users.

## **Perennial Covered Plants**

Salvage methods for perennial species will be tested for whole individuals, cuttings, and seeds. Salvage measures will include the evaluation of techniques for transplanting as well as germinating seed in garden or greenhouse and then transplanting to suitable habitat sites in the field. Techniques will be tested for each species, and appropriate methods will be identified through research and adaptive management. Where plants are transplanted or seeds distributed to the field, they will be located in reserves in suitable habitat to establish new populations. Field trials will be conducted to evaluate the efficacy of different methods and determine the best methods to establish new populations. Transplanting within the reserves will only minimally disturb existing native vegetation and soils. Supplemental watering may be provided as necessary to increase the chances of successful establishment, but must be removed following initial population establishment. Supplemental watering will include watering throughout first growing season to mimic natural rainfall patterns. During establishment, areas will be fenced off as necessary to prevent trampling or grazing by livestock. These areas will not be selected for controlled burns. Once the population has established itself, as determined by success criteria that may include setting seed, 3-year survival, or other criteria developed in agreement with the Wildlife Agencies, then fencing and irrigation will be removed and the site may be burned for management purposes if that is appropriate for the target plant.

## **Annual Covered Plants**

For annual covered plants, mature seeds will be collected from all individuals for which impacts cannot be avoided (or if the population is large, a representative sample of individuals). If storage is necessary, seed storage studies will be conducted to determine the best storage techniques for each species. A seed storage facility will also be contacted and consulted regarding collecting and storage requirements of the facility. One of the leading seed banks in California is the Rancho Santa Ana Botanic Garden in Claremont, CA (Rancho Santa Ana Botanic Garden 2010). This facility has strict seed collection and storage guidelines available on its website (<http://www.rsabg.org>).

If needed, studies will be conducted on seeds germinated and plants grown to maturity in garden or greenhouse to propagate larger numbers of seed. Such

studies can be contracted with research institutions such as the Rancho Santa Ana Botanic Garden, or carried out by other qualified biologists. Seed propagation methods will ensure that genetic variation is not substantially affected by propagation (i.e., selection for plants best adapted to cultivated conditions). Field studies will be conducted under the Adaptive Management Program to determine the efficacy and best approach for dispersal of seed into suitable habitat. Where seeds are distributed to the field, they will be located in reserves in suitable habitat to establish new populations. If seed collection methods fail (e.g., due to excessive seed predation by insects), alternative propagation techniques will be necessary.

## Condition 20. Avoid and Minimize Impacts to Covered Plant Occurrences

Almost all known occurrences of covered plants in the study area are outside the planning limits of urban growth and outside the footprint of covered activities. Many of these occurrences are expected to be included in the Reserve System. However, uncertainty remains regarding impacts on covered plants because of the lack of surveys in many areas, the general nature of some plant occurrence data, and the uncertainty in the location of some covered activities. To account for this uncertainty, impacts on covered plants are tracked by occurrence<sup>21</sup>, as described in Chapter 4. To ensure compliance with the requirements in Chapter 5, surveys for covered plants will be conducted in certain areas in order to 1) identify occurrences of covered plants, and 2) assess the condition of these occurrences.

### Covered Plant Surveys

To ensure that plants are adequately conserved relative to impacts of covered activities, plant surveys will identify occurrences of covered plants that may be affected by covered activities (see Section 5.3.1 *Land Acquisition and Restoration Actions* subheading *Incorporating Covered Plant Species*). Surveys are required in locations where covered plant occurrences are most likely to occur. Covered plant surveys will be required in the following land cover types and specific habitats. The plant species for which surveys are required are also indicated. These land cover types and habitats were identified because the majority of covered species occur primarily or exclusively in serpentine land cover types.

- Serpentine bunchgrass grassland: Survey for smooth lessingia, fragrant fritillary, Metcalf canyon jewelflower, most beautiful jewelflower, Tiburon paintbrush, and Coyote ceanothus.

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<sup>21</sup> Occurrence can be synonymous with population for some species. However, some plant species may have several occurrences in one population. Definitions of plant populations will be developed for covered plants during implementation.

- Serpentine rock outcrop: Survey for Santa Clara Valley dudleya, smooth lessingia, Metcalf canyon jewelflower, most beautiful jewelflower, and Tiburon paintbrush.
- Serpentine seep: Survey for Mount Hamilton thistle.
- Mixed serpentine chaparral: Survey for Coyote ceanothus and most beautiful jewelflower.
- Mixed oak woodland and forest with serpentine soils: Survey for Loma Prieta hoita.
- Coast live oak forest and woodland with serpentine soils: Survey for Loma Prieta hoita.
- Northern coastal scrub and Diablan sage scrub with serpentine soils: Survey for Coyote ceanothus, Metcalf canyon jewelflower, most beautiful jewelflower, and smooth lessingia.

Plant surveys will also be required in suitable habitat within a 0.25 mile (1,320 feet) radius of a known occurrence of a covered plant to ensure that known occurrences are located (in most cases, these survey areas will overlap with the land cover types listed above). The Implementing Entity will maintain a map of known occurrences and the survey radius around each one based on this Plan and updates provided by the CNDDDB (every six months) for the study area.

These surveys will be performed according to the current applicable guidelines of CDFG and/or USFWS for plant surveys (if available) except no floristic surveys are required. The appropriate survey period for each covered plant species is described in **Table 6-9**<sup>22</sup>. Surveys must be conducted at the time of year when the species can be identified in the field. In some cases, plants may be identifiable outside of the flowering period (e.g., Mount Hamilton thistle, Coyote ceanothus).

Inside the urban service area, surveys for covered plants will occur in land cover types and habitats listed above within the area on which the land cover fee will be levied and in any other areas where indirect effects could occur. The survey area must include buffers around structure where required vegetation clearing will occur to meet state and local fuel reduction regulations.

If a covered plant occurrence is observed on site, the condition of this occurrence must be described in the application package according to the guidelines in Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Activities* subheading *Incorporating Covered Plant Species*. The condition of each covered plant occurrence must be documented as a baseline to compare future monitoring (if necessary) and to ensure that occurrences are protected within the Reserve System that are in as good or better condition than those lost to covered activities.

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<sup>22</sup> These survey periods should be used as a guide only. Some plants can be readily identified by qualified botanists outside of the species' blooming period.

If a covered plant occurrence is found on the project site, the local jurisdiction will obtain the opinion of a qualified biologist regarding the projected long-term viability of a covered plant occurrence given the plant occurrence condition, site conditions, and project-level construction details. The qualified biologist will make this determination based on best available scientific information. In cases where it is difficult to project long-term viability, the qualified biologist will conservatively error in favor of the covered plant and assume that long-term viability will be reduced and the occurrence will be considered lost for tracking purposes. Impacts to covered plants will be avoided or minimized wherever possible by implementing the following conditions.

## **Avoidance and Minimization**

In order to reduce impacts to covered plants, all covered activities will be confined to the minimum area necessary to complete the activity or construction. A setback buffer will be established around covered plant occurrences located on any project site or in an adjacent area that could be affected by construction traffic or activities. The setback buffer will be adequate to prevent or minimize impacts during or after project implementation. The plants and buffer area will be protected from encroachment and damage during construction by installing temporary construction fencing. Fencing will be bright-colored and highly visible. Fencing will be designed to keep construction equipment away from plants and prevent unnecessary damage to or loss of plants on the project site. Fencing will be installed under the supervision of a qualified biologist to ensure proper location and prevent damage to plants during installation. Fencing will be installed before any site preparation or construction work begins and will remain in place for the duration of construction. Construction personnel will be prohibited from entering these areas (the exclusion zone) for the duration of project construction.

## **Site Monitoring, Assessment, and Management**

If a qualified biologist determines that the long-term viability of a covered plant occurrence will be reduced (as described below) by implementation of covered activities, the loss must be offset by protection, management, and monitoring of covered plant occurrences in the Reserve System prior to impacts (**Table 5-16**).

Some covered plant occurrences may only be disturbed or partially affected by covered activities, and viability may be maintained. It is important to monitor and, if possible, maintain these occurrences of covered plants where they occur, even if they are not protected within the Reserve System. Covered plant occurrences that are determined to be partially permanently affected by a qualified biologist (i.e., only a portion of the occurrence is impacted) by covered activities will be monitored by the Implementing Entity. The purpose of the monitoring will be 1) to assess whether the impact reduces the long-term viability of the occurrence and whether supplemental management actions are feasible and warranted, and 2) to determine whether the Implementing Entity must protect and



enhance or create<sup>23</sup> occurrences in the Reserve System according to **Table 5-16**. If the impact occurs to less than 5% of the total occurrence as measured by the number of individuals at the time of impact, then the impact is assumed not to affect long-term viability and will not require monitoring nor will it count as a permanent impact (**Table 4-6**). This allowance does not apply to Coyote ceanothus.

When determining viability for the purpose of assessing a partial or permanent impact, the Implementing Entity will consider the following factors.

1. Results of monitoring plant occurrences affected by covered activities (e.g., correlation between pre-project observations and actual viability post-project).
2. Impacts to date to the covered plant species and how close total impacts are to the allowable impact cap in the Plan (e.g., extra care taken when near cap not to exceed the cap).

Specific monitoring protocols and success criteria will be developed during implementation as appropriate for each covered species, according to the guidelines discussed here. Monitoring protocols can draw on those developed for other HCP/NCCPs. It is possible that only a portion of the occurrence will be located on the covered activity project site. In such instances, the monitoring protocol will address this issue. Three possible approaches include the following.

1. If the landowner agrees, the Implementing Entity will obtain access to the adjacent sites on which the rest of the plant occurrence is located, and surveys will include the entire occurrence.
2. If access to adjacent site(s) is not possible, or if for some other reason it is not feasible to survey the entire occurrence, then an alternative will be developed to estimate the extent and condition of the adjacent portion of the occurrence.
3. If only a small portion of the occurrence is on adjacent properties, then only the portion of the occurrence on the project site will be monitored and assessed for viability. The determination whether this is a full impact will be made based on the results for this portion of the occurrence only.

Population monitoring will be conducted by the Implementing Entity before the covered activity is implemented to document the baseline condition. For annual species, the minimum post-construction monitoring period will be 5 years. If extreme or unusual climate conditions affect the species, then monitoring will be extended 1 or 2 years, as appropriate to assess impacts and success. Monitoring will include estimates of percent cover and number of individuals. An occurrence will be assumed to retain long-term viability and will not require replacement in the Reserve System if the decline in occurrence size and percent cover from pre-project conditions is less than 25% over the monitoring period,

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<sup>23</sup> Creation is only allowed to mitigate effects for Coyote ceanothus. All other plant occurrence creation would contribute to recovery (**Table 5-16**).

unless site-specific conditions otherwise suggest substantial declines in occurrence viability.

For perennial species, the minimum post-construction monitoring period will be 3 years. Monitoring will include estimates of density (percent cover), recruitment of seedlings if impacts included removing individuals, and measurements of adult plant health (e.g., signs of disease, herbivory, nutrient deficiencies, etc.). An occurrence of a perennial covered species will be assumed to retain long-term viability and will not require replacement in the reserve system if the decline in seedling recruitment and density from pre-project conditions is less than 25% over the monitoring period, unless site-specific conditions otherwise suggest substantial declines in occurrence viability.

The Implementing Entity will implement conservation actions on the site that would help to maintain or improve the condition of the occurrence, as long as an agreement can be reached with the landowner to conduct these measures. Possible conservation measures are described in Chapter 5. If plant occurrences are determined to not be viable based on post-project monitoring, the Implementing Entity must assess the loss as a full permanent impact and implement conservation actions accordingly. In these cases, mitigation would occur after the impact. However, the potential for mitigation to occur after impacts is unlikely given that the qualified biologist and Implementing Entity will make conservative determinations regarding projected impacts on long-term viability.

## **6.7 Receiving Take Authorization under the Plan**

Take authorization will be provided by the Plan to three broad categories of covered activities: public projects proposed by the Permittees, private projects under the jurisdiction of the Permittees, and public projects by non-Permittees in the study area that are approved for inclusion by the Implementing Entity. Each of these situations is explained below.

### **6.7.1 Evaluation Process for Permittee Projects**

The Plan permits provide the Permittees with take authorization along with the authority to approve covered activities complying with the terms of the Plan. If a Permittee undertakes a covered activity (see Chapter 2), the Permittee must document compliance with the Habitat Plan and provide a copy of this documentation to the Implementing Entity for tracking purposes (i.e., to track the amount of take coverage granted) before the Permittee take authorization may be used. As described in Chapter 8, the Permittees will develop a template Habitat Plan application package for use by private applicants and Permittees that includes all items described in this section prior to permit issuance. It is expected that the documentation will be similar to the *Habitat Plan application package*

required of private project proponents<sup>24</sup> applying to local jurisdictions for coverage (this application package is described in detail in Section 6.8 *Habitat Plan Application Package*, below).

## Review and CEQA for Permittee Projects

Many covered activities are expected to be subject to CEQA<sup>25</sup>. When Permittees initiate projects that are also subject to CEQA, the terms of the Habitat Plan should generally be integrated into the CEQA environmental review process. To facilitate CEQA coordination, the Permittee should begin preparation of the Habitat Plan application package (or equivalent material) when the CEQA project description and alternatives for the project are developed such that requirements of the Habitat Plan can be used to inform site design and selection of the preferred alternative. The completed Habitat Plan documentation should be evaluated and approved by the appropriate CEQA lead agency of the Permittee concurrently with the lead agency's review of the associated CEQA documents. Projects exempt from CEQA may still be covered activities under this Plan and require compliance with the conditions of this Plan as described in this chapter.

## Receiving Take Authorization for Permittee Projects

Incidental take associated with covered activities carried out by the Permittees is authorized under the permits issued for the Habitat Plan. These projects are therefore “pre-approved” for take authorization by the Wildlife Agencies as long as their effects were adequately analyzed, they meet the conditions of the Plan, and they pay the appropriate fees, if applicable. Each Permittee is responsible for ensuring that its covered activity is compliant with the conditions of approval described in this chapter. Take authorization will be in effect once the Permittee documents consistency with the Habitat Plan. The form developed by the Implementing Entity to document the consistency of private development with the Plan may also be used by Permittees for their own projects. Documentation of Plan consistency and a complete Habitat Plan application package must be submitted to the Implementing Entity for tracking purposes. The process for receiving take authorization under the Plan for public projects of the Permittees is shown in **Figure 6-5**.

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<sup>24</sup> The term *project proponent* is used interchangeably with the term *applicant* or *project applicant* in this and subsequent chapters.

<sup>25</sup> Permittee covered activities that may not be subject to CEQA include operations and maintenance activities and projects that only require ministerial approval within local jurisdictions such as single family home construction.

## 6.7.2 Application Process for Private Projects

Private applicants seeking coverage under the Habitat Plan, including applicants that wish to opt in to the Plan<sup>26</sup>, will apply to their local jurisdiction by submitting a *Habitat Plan application package* described in Section 6.8 *Habitat Plan Application Package*. A checklist for evaluating these applications will be developed by the Implementing Entity prior to the first ordinance implementing the Plan taking effect. The local jurisdiction will review the Habitat Plan application package for completeness in accordance with the checklist. For requests to opt in, the local jurisdiction will also evaluate the amount of take requested (i.e., acres of impacts) and whether or not take coverage is available for the project. If the application package is not complete, it will be returned to the project proponent with an explanation of why it is incomplete. If the application package is complete, the local jurisdiction will calculate the required fees on the basis of the requirements described in Chapter 9 and consistent with the local ordinance implementing the Plan. The determination of completeness of the application package rests with the local jurisdiction. If they choose, local jurisdictions may request technical assistance from the Implementing Entity staff in their review.

All applicable conditions will be identified and fees paid at (or before) the time of issuance of the first authorization of ground disturbance (typically a grading permit or building permit). In cases where there is no grading or other ground disturbance permit, the fees will be due upon issuance of the first permit that authorizes construction. If the project proponent requests to contribute land in lieu of fees or requests special project conditions, such requests must be reviewed and approved by the Implementing Entity. See Chapter 8, Section 8.2.1 *Permittees* for Permittees that may grant take authorization and Section 8.7 *Roles and responsibilities in Reviewing Applications for Take Authorization* for additional detail on application review.

The process for receiving take authorization for private projects is shown in **Figure 6-6**. Local agencies reviewing the Plan application package will be subject to the processing time and other requirements of the Permit Streamlining Act (Section 65920 et seq.) which requires public agencies to follow standardized time limits and procedures when making specific types of land use decisions.

## Application Review and CEQA for Private Projects

Many private covered activities will require a land use approval and be subject to CEQA. For such covered activities, review of applications for take authorization should generally be undertaken concurrently with the CEQA environmental review. To facilitate this approach, the local jurisdiction should generally request

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<sup>26</sup> Private parties that are not subject to the Plan (see **Figure 2-5**) have the option to request coverage under the Plan from the applicable local jurisdiction.

that project proponents submit initial Habitat Plan application package information as part of the land use approval application and CEQA process.

There are many benefits to drafting the Habitat Plan application early in the planning process. First, submitting initial Plan application package information during the land use approval / CEQA process will illustrate the various requirements of the Habitat Plan on the proposed project, and provide time for the project proponent to change the project description or to identify alternatives for CEQA analysis. Second, it will enable the CEQA document to refer to the project-specific requirements as identified in the draft Plan application. Finally, it will enable the local jurisdiction to provide early review of the Plan application for completeness. Based on a review of this initial information and a determination of the Habitat Plan requirements, the local jurisdiction can establish conditions of approval specifying the Habitat Plan conditions and fee requirements. Habitat Plan fees will need to be paid prior to the issuance of construction permits (grading / building permits).

Each local jurisdiction is responsible for ensuring that covered activities, upon issuance of take, fully comply with the terms of the Habitat Plan.

## **Granting Take Authorization for Private Projects**

Proponents of private projects that are covered by the Plan and not exempt (see Section 6.2 *Exemptions from Conditions*) must have their projects conditioned by the local jurisdiction obligating compliance with all terms and conditions of the Implementing Agreement, the Plan, and the state and federal permits that apply to the project prior to the local jurisdiction issuing take authorization. Such terms and conditions include, but are not limited to, those listed below.

- Compliance with all relevant avoidance, minimization, surveys, monitoring, and conservation measures determined by the local jurisdiction to apply to the project as required by the Plan.
- The right for the Permittee to monitor the applicant's compliance with all applicable conditions of this Plan.
- Imposition of a fee or dedication of land in lieu of the fee as described in Chapter 9 and in the local Implementing Ordinance.

Before take authorization is granted, Permittees must prepare a written determination of the project's consistency with the Plan. A template form for private applicants that documents this determination of consistency will be developed by the Implementing Entity prior to the first local ordinance taking effect (this consistency determination will be made based on the application checklist described above).

Once the Habitat Plan application package is deemed complete, the conditions of approval have been established and imposed, and the required fees (if applicable) have been paid, the project proponent will be granted take authorization by the

appropriate Permittee (see Chapter 9 for required fees and payment times). At this point, the project proponent will be allowed to proceed with the project consistent with other applicable local, state, and federal laws and local entitlements. Take authorization for impacts on covered species will be provided by the applicable Permittee consistent with the state and federal permits issued to all Permittees. Each local jurisdiction, working with the Implementing Entity will develop a process to document projects that receive take authorization but do not proceed with the project to have the take authorization removed from the Implementing Entity's records.

When Habitat Plan application packages are completed, each Permittee must provide a copy of the application material to the Implementing Entity for entry into the Habitat Plan database (described in Chapter 8 *Plan Implementation*).

### 6.7.3 Application Process for Non-Permittee Public Projects

Because the list and evaluation of covered activities in Chapter 2 is meant to be comprehensive, the Plan has included some projects that will be proposed by public entities that are not Permittees. For example, a special district or local school district may propose to build a project in one of the three participating cities or the unincorporated County. Although the special district or school district is not subject to the land use jurisdiction of the participating jurisdictions, the impacts of its project have been covered by the Plan and evaluated as part of the planned urban development within the jurisdiction. To receive coverage under the Plan, projects proposed by an entity that is neither a Permittee nor subject to the land use authority of a Permittee, the project proponent must apply directly to the Implementing Entity as a *Participating Special Entity*. The entity will provide the same Habitat Plan application package as private entities seeking coverage. See Chapter 8, Section 8.4 *Participating Special Entities*, for more details on the process by which Participating Special Entities receive take authorization under the Plan.

## 6.8 Habitat Plan Application Package

Private projects that are covered by the Plan must submit a *Habitat Plan application package* to the local jurisdiction for review and approval in order to receive coverage under the Habitat Plan. For their own projects, Permittees must submit an application package to the Implementing Entity for tracking purposes and pay the appropriate fees if applicable. The project proponent is responsible for preparing the application package and paying for any necessary field surveys, if required. The application package must contain the following items, if applicable, each of which is described in detail in this section.

- Item 1: An application form for coverage under the Plan.

- Item 2: A brief description and map of the project.
- Item 3: Documentation of land cover types on site.
- Item 4: Map of wetlands and waters, if applicable.
- Item 5: Results of applicable surveys for selected covered species.
- Item 6: Documentation of any additional and applicable avoidance and minimization requirements that will be implemented.

Each item in the application package builds on the previous item. For example, surveys for certain covered wildlife and plants (Item 5) are required only if specific land cover types are documented on the site (Items 3 and 4). Many covered activities will be able to comply with the Habitat Plan by only completing Items 1, 2, and 3 of the application package. For others, field surveys are limited to only the highest-value biological resources.

Most components of the application package can be prepared by the applicant, with the assistance of local planning staff. In some cases, the Plan requires that components be prepared or surveys or monitoring be conducted by *qualified biologist*. Please see *Qualified Biologists* below for details on the qualification process.

Templates for all these application components will be provided by the Implementing Entity to each local jurisdiction prior to the first local ordinance taking effect. These templates will also be posted on the Habitat Plan web site for use by private applicants and their consultants. Use of the templates will streamline the review and approval process by local jurisdictions. The Permittees may adjust the required components of the application package over time, consistent with the requirements of the Plan. To recover the costs of reviewing and processing these application packages, local jurisdictions may charge a fee associated with the application (see Chapter 9 for details).

The Habitat Plan application package, survey requirements, and conditions of approval were designed with the following principles in mind.

- Provide the necessary data to track impacts of all covered activities to allow the Implementing Entity to meet Plan requirements (e.g., land acquisition, Stay-Ahead provisions, wetland restoration).
- Simplify and reduce pre-project survey requirements relative to current and future environmental regulations throughout the Habitat Plan.
- Avoid and minimize impacts on covered species and natural land cover types to the maximum extent practicable on a regional scale, in compliance with federal and state endangered species laws.
- Ensure that survey requirements are proportional to impacts—the survey burden is lower on low-quality habitat than on high-quality habitat.
- When possible, limit survey requirements under the Plan to those required for other local, state, or federal environmental compliance (e.g., CEQA or

NEPA), and redirect resources previously spent on biological surveys to improve regional conservation.

Each of the required application components is described below.

### **6.8.1 Item 1: Project Application Form**

The project application form will contain basic information about the project. The Implementing Entity will develop a form prior to issuance of the state and federal Plan permits that will be made available to the Permittees. Required forms will be available through the local jurisdictions and on the Habitat Plan website.

### **6.8.2 Item 2: Project Description and Map**

The application package will include a brief project description including the location, assessor's parcel number, construction activity or maintenance methods, a description of the nature of the impacts (permanent or temporary), and timing (including duration) of the project or activity. The project description will be sufficient to document that it is a covered activity in the Plan (see Chapter 2). A legible vicinity map of the project site will also be provided to document that the project is within the Habitat Plan study area. A vicinity map will include any streams or water bodies that fall within the mapped area. If the project is located in Fee Zone A or B, but the project applicant believes that the project qualifies for Fee Zone C, the project applicant must demonstrate compliance with the criteria provided in Chapter 9, Section 9.4.1 *Habitat Plan Development Fees*, subheading *Land Cover Fee Zones*. A project detail map will be included that shows the area on which fees will be levied, as well as the full project parcel if inside the urban service area or the full development area if outside the urban service area, and any relevant landforms, roads, water bodies, and existing and proposed structures that will be affected by the proposed project.

### **6.8.3 Item 3: Land Cover Types on Site**

As described in Chapter 3 *Physical and Biological Resources* a detailed land cover map was developed for the study area for this Plan. This land cover map was essential in estimating impacts of the covered activities (Chapter 4) and developing the conservation strategy (Chapter 5). However, due to limitations in the land cover mapping (see **Table 3-4**) and the potential for land cover to change over time, land cover types must be verified at the time applications are submitted. This step is also critical because almost all impacts under the Plan are tracked by land cover type.



Proponents of all projects and activities with quantifiable impacts, including approved Participating Special Entities, will specify the amount and type of land cover that will be permanently and temporarily impacted. All fees are paid on the development area (see **Figure 6-1**) except for land inside the urban service area designated with a land use of Urban Development or Rural Residential (see **Figure 2-2**) that is less than 10 acres, where fees are assessed on the parcel. In addition, all public corridor projects (e.g., stream and utility) pay fees based on the project footprint, regardless of parcel size. As described in Condition 12, projects that do not completely avoid indirect effects to wetlands (including wetlands on parcels adjacent to the covered activity development area) will be considered permanently impacted and will count towards the impact caps described in **Table 4-2** and will be assessed fees as described in Chapter 9.

Project proponents of activities that have temporary impacts are required to provide photographs that document the condition of the project site before the activity is implemented. These photographs will be compared to those required for post-project conditions (see Item 6) to determine if impacts were temporary and that appropriate fees were paid.

All calculations and other information provided in application packages will be verified by the local jurisdiction or Implementing Entity so that all impacts to land cover types can be tracked appropriately and fees paid. This exercise can be performed through air-photo analysis or field verification. Project proponents may request assistance from local planning staff in this analysis (for exempt projects, local jurisdictions will document land cover types present). For sites outside urban or suburban areas that support natural land cover types, land cover verification may need to be performed by a qualified biologist. Land cover type classification will be done in accordance with the descriptions provided in Section 3.3.5 *Natural Communities and Land Cover Types*. If the project site supports or may support any wetland or stream land cover types that would be affected by the proposed project, a qualified biologist must be retained (see Item 4 below).

All land cover determinations provided by private applicants will be verified by local planning staff. All land cover determinations provided by a Permittee will be verified by Implementing Entity staff. A private applicant or Permittee may retain Implementing Entity staff (at cost) to conduct this land cover mapping. Local jurisdiction staff may also be available to provide this service to private applicants as part of the application review process.

Land cover mapping of sites with the following land cover types, as mapped by the Plan, can be conducted by the applicant or local planning staff.

- California annual grassland<sup>27</sup>;
- reservoirs;

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<sup>27</sup> See definition of annual grassland in Chapter 3. When trees are present in annual grassland at low density, the land cover may instead be oak woodland. In these cases, a qualified professional is needed to make the determination.

- all agricultural land cover types; and
- all development land cover types.

Additions to existing development encompassing an area of 10,000 square feet (approximately 0.2 acre) or less on any land cover type, other than stream, riparian, serpentine, pond, or wetland land cover types, do not require land cover mapping by a qualified biologist or other professional. These projects may be mapped based on aerial photos by planners or applicants.

All other land cover types must be mapped by a qualified biologist. Forest land cover types can also be mapped by a professional forester or arborist. Accurate mapping of the remaining land cover types is necessary because of the Implementing Entity's obligation to stay ahead of impacts by land cover type and to ensure the appropriate species surveys are conducted. The Implementing Entity will provide a list of qualified biologists to conduct land cover mapping and other surveys required by the Habitat Plan. The Implementing Entity may also provide a list of qualified professionals (e.g., non-biologists such as foresters and arborists) to conduct land cover mapping. Biologists and other professionals qualified to conduct land cover mapping will have demonstrated experience conducting vegetation mapping in the field or from air photos at the scale of the proposed project and in vegetation types similar to those on the project site. This list will be updated regularly and made available to project proponents and the Permittees. Biologists conducting species surveys that could result in take must also be pre-approved by USFWS and CDFG (see Item 5 below).

Land cover mapping is not required for operations and maintenance activities conducted by Permittees except where serpentine land cover will be impacted (land cover mapping is required for all private applicants and Participating Special Entity projects). However, Permittees must still implement all applicable conditions including plant surveys. As such, some projects with operations and maintenance covered activities may require land cover mapping to determine applicable conditions. If no land cover mapping is conducted, Permittees will rely on the most recent land cover map developed by the Implementing Entity to quantify impacts.

For covered activities that result in temporary impacts, in lieu of aerial photo or field-verified land cover mapping, applicants have the option of assuming that the entire footprint of the covered activity permanently affects natural land cover types based on the Plan's most recent land cover map (and therefore pays a fee on these impacts as described in Chapter 9). This option is available for temporary impacts because the footprint of many of these activities is expected to be relatively small. If the land cover types assumed to be permanently impacted include those land cover types that trigger covered species surveys, then covered species surveys must be conducted.

The application package must include a map showing all land cover types on the project parcel(s) if the project is located inside the urban service area or within the development area if the project is outside the urban service area, and a table showing the amount of each land cover type to the nearest 0.1 acre for all non-

stream land covers or linear foot for streams (blank tables will be provided in the template application package). These final values will be used to calculate any required fees (Chapter 9).

**Table 6-8** describes land cover types and habitat elements that, when present, trigger the need for preconstruction surveys for five covered wildlife species. For example, if a project is located within occupied nesting habitat modeled for burrowing owls, a qualified biologist would need to conduct a habitat survey and possibly a pre-construction survey to map any burrows within 250 feet of the activity footprint. In some cases, presence of the habitat feature itself, regardless of land cover, may trigger additional survey requirements (**Table 6-8**).

The presence of certain land cover types on site may also trigger the need to survey for specific covered plants, as described in Item 5 below.

## 6.8.4 Item 4: Map of Wetlands, Ponds, Streams, and Riparian Woodlands

A map of all coastal and valley freshwater marsh, seasonal wetlands, ponds, riparian woodland, and streams is required for any project subject to the Habitat Plan that may directly or indirectly affect these aquatic land cover types.

Although Section 404 Clean Water Act wetland delineations are a tool that can be employed, jurisdictional delineations completed to meet the requirements of Section 404 do not necessarily account for all aquatic habitat for species proposed for coverage under this Plan (e.g., they do not address waters of the state that are not also waters of the U.S.). The Implementing Entity will use the wetland and waters map<sup>28</sup> developed for Item 4 of the application package to track impacts to coastal and valley freshwater marsh, seasonal wetlands, ponds, riparian woodland, and streams and to determine the wetland fee owed (see Chapter 9, Section 9.4.1, subheading *Wetland Mitigation Fee* and **Table 9-6**). Fees on wetlands, ponds, and riparian woodland will be determined by the acres of impact (see Condition 12 above and Chapter 9). Stream fees and impacts will be determined by the linear feet of stream affected, measured at the stream centerline.

Project proponents will not need to provide Item 4 of the application package if the Implementing Entity or permitting local jurisdiction determines that aquatic features will not be directly or indirectly affected by covered activities.

Formal delineations are typically required to identify waters of the U.S. and support compliance with Section 404 of the Clean Water Act. Maps of non-jurisdictional aquatic features are typically required to identify waters of the state

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<sup>28</sup> Although delineations can be conducted any time of the year, they will be based on an evaluation of multiple factors by a qualified biologist, including but not limited to, hydrology, vegetation, and soils. Wetland features do not need to be holding water at the time of the field investigation to be delineated.

and support compliance with the Porter-Cologne Water Quality Control Act and Section 1602 of the California Fish and Game Code.

Project proponents are encouraged to produce maps for Item 4 that support other necessary state or federal permitting needs, but maps do not need to be verified by the Corps or Regional Boards prior to submission of the application package. If the Habitat Plan application will also meet the application requirements of the Habitat Plan RGP, once such a permit is in place, the delineation method must be consistent with Corps's delineation protocol. Such delineations may be verified by the Corps prior to application submittal, or delineations may be verified by the Corps as part of application processing once the application is submitted.

If a process for permitting projects affecting waters of the U.S. and/or waters of the state is not provided by local jurisdictions or the Implementing Entity in conjunction with the Plan, proponents of projects that could affect such resources must seek such permits on their own. In such cases, this Plan does provide the framework for CESA and ESA compliance for covered activities that would result in impacts on state or federal wetlands and waters.

## 6.8.5 Item 5: Results of Applicable Species Surveys and Monitoring

As described in Item 3, the presence of certain land cover types on the project site triggers an evaluation of whether specific habitat elements for selected wildlife species or for occurrences of covered plants. **Figure 6-7** summarizes these triggers and survey process. Survey requirements for these selected wildlife species are based on avoiding take of individual species—particularly animals with lower reproductive outputs (e.g., western burrowing owl) than other species (e.g., fish and amphibians). If suitable breeding habitat of these selected wildlife species is found, preconstruction surveys are triggered (see Conditions 15–18). If the preconstruction survey identifies occupied breeding habitat, project proponents must implement defined avoidance and minimization measures to avoid the resource during breeding seasons. Compliance during construction will be monitored by a qualified biologist.

As described below in this section under *Surveys for Covered Plants*, covered plant surveys will be required for specified land cover types. If an occurrence of a covered plant is present on the site, additional field assessment is required to document the occurrence's condition.

The purpose of these surveys is to comply with the avoidance and minimization requirements of ESA and CESA. If surveys are planned far enough in advance (typically 6–8 months), it is expected that in most cases identification of selected occupied habitat will not change the project design or schedule. These survey requirements and avoidance measures are designed to avoid or minimize take of individuals (as required by law), to document key resources for tracking

purposes, and to ensure that impacts on plant occurrences are properly mitigated by the Implementing Entity.

Although surveys are required in specific cases, overall, impacts on covered species are assumed to occur on all project sites. However, if the results of the preconstruction survey documents a large or important population of a covered species other than those acknowledged in the Plan, the local agency reviewing or proposing the project must consult the Implementing Entity for advice on species avoidance and minimization measures<sup>29</sup>. The Implementing Entity will also contact the Wildlife Agencies for technical advice. Protocol-level surveys to document species presence or absence are not required for the Habitat Plan, with the exception of the least Bell's vireo (Condition 16).

Species surveys are required for all covered activities, including some operations and maintenance activities, subject to the conditions on covered activities except as noted in the following section. Species survey requirements and exemptions are described in greater detail below.

## Exemptions from Species Surveys, Preconstruction Surveys, and Construction Monitoring

The following types of covered activities are exempt from species survey and construction monitoring requirements for target covered wildlife species and covered plants. A summary of the types of exemptions available is described in **Table 6-1**. Activities exempt from species surveys must still submit an application package as described above.

- Covered operations or maintenance activities, including those on the Reserve System, that do not result in any ground disturbance or removal of natural land cover types not identified in the following exemptions.
- Covered operations or maintenance activities that occur more than once annually within the same location, as long as applicable surveys are conducted once before initiating the activity in the appropriate season (i.e., wildlife and plant surveys must be conducted during the appropriate time of year) and there are negative survey results. Such activities are likely to result in repeated disturbance that will preclude establishment or persistence of the covered species targeted by these surveys. If species surveys identify wildlife covered species, preconstruction surveys and construction monitoring must be conducted according to the conditions in this chapter. Unavoidable impacts to covered plant species will be tracked toward the Plan's impact limits (**Table 5-16**). All applicable wildlife and plant surveys must be conducted prior to implementation of the covered operations or maintenance activity until the covered species has not been detected at the site for three consecutive years. Applicable surveys will once again be

<sup>29</sup> If new information is found through surveys or other data that greatly changes the understanding of covered species distribution or habitat requirements from that described in this Plan, the Plan would need to be re-evaluated and an amendment may be necessary (see Chapter 10 for the amendment process).

required if operations and maintenance activities cease for three or more consecutive years.

- Covered activities that occur entirely on one or more of the following land cover types<sup>30</sup>.
  - ❑ Coyote brush scrub.
  - ❑ Reservoir.
  - ❑ Stream (i.e., riverine) where no riparian or wetland vegetation occurs.
  - ❑ Agricultural developed<sup>31</sup>.
  - ❑ Urban-suburban.
  - ❑ Rural-residential.
  - ❑ Ornamental woodland.

In addition to the exemptions listed above, covered activities occurring on the land cover types listed below, while subject to the wildlife species surveys, preconstruction surveys, and construction monitoring requirements, will not trigger any covered plant surveys<sup>32</sup>.

- Willow riparian forest and scrub.
- Redwood forest.
- Coastal and valley freshwater marsh.
- Pond.
- Orchard.
- Vineyard.
- Grain, row crop, hay and pasture, disked/short-term fallowed.
- Golf courses/urban parks.
- Barren.

## Qualified Biologists

Several types of monitoring will be conducted for this Plan including species surveys, preconstruction surveys, construction monitoring, and effectiveness monitoring conducted on the Reserve System. This requirement applies to all monitoring described in this Plan including conditions on covered activities described in this chapter and effectiveness monitoring described in Chapter 7.

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<sup>30</sup> These land cover types do not support any of the covered species for which surveys are required.

<sup>31</sup> The land cover type “agriculture developed” (also known as agriculture developed/covered ag) is defined in Chapter 3 as intensive agricultural operations such as nurseries and greenhouses.

<sup>32</sup> Focused surveys for selected covered wildlife may still be required; consult **Table 6-8** and Conditions 13 and 15–18.

*Qualified biologists* are those biologists who have the experience, education, and training necessary to perform the tasks described in this Plan accurately and in an unbiased fashion. The term “qualified biologist” is used generically to mean a biologist who is trained to perform the given task; such a person is, more specifically, a fisheries biologist, wildlife biologist, or botanist. Training must be in the field to which the task is related. For example, a wildlife biologist may not perform a covered plant survey or delineate land covers for a project application unless the individual is also competent in those fields.

If the task does not have the potential to result in take of covered species (e.g., land cover mapping, establishing perimeters around an active nest or burrows, or monitoring the compliance of construction crews), applicants (or Permittees) may choose their own biologists to conduct these specialized tasks. Applicants will provide the local jurisdiction with a brief resume of the biologist so that the local jurisdiction (or in the case of a Permittee project, the Implementing Entity) can verify the qualifications of the biologist. The local jurisdictions will review these qualifications with the application package. If the local jurisdiction finds the qualifications lacking, they may ask the applicant for additional information or for another survey by a more qualified biologist.

If the task has the potential to result in take of covered species (e.g., discouraging use of a den by a San Joaquin kit fox, handling a California tiger salamander, or conducting effectiveness monitoring described in Chapter 7), the biologist must be approved by the Implementing Entity and Wildlife Agencies prior to conducting such tasks. Biologists conducting this work may be Implementing Entity staff or consultants hired by the Implementing Entity.

To be approved, these biologists must provide the Implementing Entity with credentials demonstrating that he or she has an understanding of the monitoring protocols, data collection techniques, and handling procedures for the covered species. If the Implementing Entity deems the biologist qualified, then the Implementing Entity will forward the recommendation to the Wildlife Agencies for approval. The names, contact information, and written certification of training and qualifications for these biologists will be provided to the appropriate Wildlife Agencies for approval. This documentation will also be on file with the Implementing Entity.

Upon Implementing Entity and Wildlife Agency approval, the Implementing Entity will maintain a list of *pre-approved* qualified biologists who may conduct monitoring work for a 5-year period. This approval process will reduce the need for 2081(a) and/or 10(a)(1)(b) permits as well as the need for the Wildlife Agencies to review qualifications on a case-by-case basis during implementation.

Individuals who are not pre-approved by the Implementing Entity and Wildlife Agencies to conduct monitoring with the potential for take may conduct monitoring if they have a valid recovery permit for the species that they are monitoring. In either case, the biologist will possess all of the qualifications that would otherwise be required under a recovery permit.

## Surveys for Breeding Habitat of Select Covered Wildlife Species

While take of covered species and impacts to their known and suitable habitat is assumed and mitigated under the regional approach to mitigation and conservation described above, avoidance of breeding habitat for selected covered wildlife species is required. The selected species have the greatest potential to benefit from avoidance measures and are generally species with lower reproductive rates, such as birds and mammals, which suffer greater consequences from take of individuals, particularly when breeding. Survey requirements for these species are triggered by the presence of specific land cover types and habitat features as described in **Table 6-8**. These species and their habitat features are listed below.

- Western burrowing owl (occupied and nesting habitat, see **Figure 5-11**).
- Least Bell's vireo (breeding habitat in South County<sup>33</sup>, see species habitat distribution model in **Appendix D**).
- Tricolored blackbird (breeding habitat, see species habitat distribution model in **Appendix D**).
- San Joaquin kit fox in the Pacheco corridor (denning habitat; see species habitat distribution model in **Appendix D**).
- Bay checkerspot butterfly in serpentine bunchgrass grassland in Bay checkerspot butterfly habitat units (see **Appendix D**).

If suitable breeding habitat<sup>34</sup> for these species as defined in **Table 6-8** and in Conditions 13 and 15–18 is identified on site, and if the proposed project could affect this habitat, additional preconstruction surveys are required for the San Joaquin kit fox, western burrowing owl, tricolored blackbird, and least Bell's vireo. Specific survey requirements for these species are detailed in Conditions 13 and 15–18. Surveys for these species will occur on all areas on which the land cover fee will be levied and within any areas that may be encroaching within a required species buffer.

If applicable land cover types or habitat features are present on site, the application package must describe the methods used for the required surveys and the results of these surveys. As indicated in **Table 6-8**, a map of habitat features (e.g., suitable kit fox dens, suitable burrowing owl burrows) is required. If a covered species is observed on site, details of this observation will also be included in the application. CNDDDB California Native Species Field Survey Forms will be included for all covered species encountered on the site. Copies of these forms will also be submitted to the CNDDDB.

<sup>33</sup> The least Bell's vireo range may expand to the northern portion of the study area during the permit term. The Implementing Entity will periodically monitor outside of the vireo's modeled habitat in the study area to determine if the species' range is expanding (see Section 7.3.3 of Chapter 7, *Species-Level Actions*).

<sup>34</sup> Suitable breeding habitat is defined as habitat identified in the field as suitable for breeding by the target species. Suitable breeding habitat may be different from modeled habitat.



## Preconstruction Surveys for Select Covered Wildlife

If the appropriate land cover type and habitat feature listed in **Table 6-8** are present on site, then a preconstruction survey is required for one or more of the five covered wildlife species listed above (**Figures 6-5 and 6-6**). Preconstruction surveys will be required to establish presence or absence of occupied breeding habitat for the applicable species. For example, if a freshwater wetland that could provide suitable breeding habitat for tricolored blackbird is present on site, a preconstruction survey on the site would need to be conducted prior to construction to determine if the site is occupied. If results indicate that breeding tricolored blackbirds are present, then avoidance and minimization measures and construction monitoring must occur, as described in **Table 6-8** and Condition 17.

The Habitat Plan application package will be prepared before project construction in order to receive project approvals from the local agency (or if by a Permittee, to ensure compliance with the Habitat Plan). To ensure compliance with preconstruction survey requirements, project proponents must describe in the application package which surveys are required, when they will be performed, and how they will be applied to the project. This description will follow the requirements in **Table 6-8** and Conditions 15–18 and will be incorporated into the conditions of project approval.

## Construction Monitoring for Certain Covered Wildlife

Identification of occupied breeding habitat as defined above will trigger the specified avoidance and minimization requirements described in **Table 6-8** and Conditions 15–18. Construction monitoring will be carried out by a qualified biologist to ensure that these avoidance and minimization requirements are being implemented properly and that they are adequately protecting the target species (**Figures 6-4, 6-5, and 6-6**). Because the selected wildlife species are rare in the study area, it is expected that few projects will require construction monitoring. If required, the construction monitoring frequency and protocols are described for the appropriate species in Conditions 15–18.

Like preconstruction surveys, construction monitoring will occur well after the Habitat Plan application package is prepared. To ensure compliance with the Plan, the application package must describe which construction monitoring and avoidance and minimization requirements may be required and how they will be applied to the project if preconstruction surveys identify occupied breeding habitat. This description will follow the requirements in **Table 6-8** and Conditions 15–18 and will be incorporated into the conditions of project approval. The application will include a description of monitoring frequency and duration (including the time when monitoring will be initiated relative to impacts) and specific construction activities to be monitored. The application will also include a description of the authority of the onsite construction monitor to modify or temporarily stop implementation of the activity if necessary to ensure compliance with the Plan.

Construction monitoring is necessary to ensure that avoidance and minimization measures are implemented in accordance with permit requirements and is the responsibility of the project proponent.

## Covered Plant Surveys

Project proponents wishing to affect occurrences of covered plants must notify the Implementing Entity of their construction schedule to allow the Implementing Entity the opportunity to salvage the occurrence (see Condition 19).

The application package must describe the methods used for the required plant surveys and the results of these surveys. If a covered plant occurrence is observed on site, the condition of this occurrence must be described in the application package according to the guidelines in Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Activities* subheading *Incorporating Covered Plant Species*. The condition of each covered plant occurrence must be documented to ensure that occurrences are protected within the Reserve System that are in as good or better condition than those lost to covered activities. CNDDDB California Native Species Field Survey Forms will be included in the application package for all covered plants encountered on the site. Copies of these forms will be submitted to the CNDDDB.

### 6.8.6 Item 6: Compliance Documentation

The final component of the Habitat Plan application package is documentation of how any remaining applicable conditions (Conditions 1–14) have been incorporated into the proposed project. If appropriate, a map will be provided to document this compliance.

Verification that conditions have been implemented is primarily the responsibility of the local jurisdiction conducting or approving the covered activity. Participating local jurisdictions will be responsible for reporting the relevant details of approved projects to the Implementing Entity (for entry into the Habitat Plan database and for required reporting to the Wildlife Agencies). The Implementing Entity may contact the local jurisdiction to verify and ensure that the conditions are appropriately implemented.

If the project includes activities for which temporary fees are paid, the project applicant is required to file compliance information at the conclusion of the project. The compliance information will include documentation that the area for which temporary fees were paid was disturbed by covered activities for less than one year. The project proponent must also provide photographs that document the condition of the site before project initiation and (or less) after completion of the covered activity. Based on this information, the local jurisdiction or Implementing Entity will make a determination that the site was recovered to pre-project or ecologically improved conditions within one year of completing

construction, that the impacts were actually temporary, and that the fees paid were adequate.

## 6.9 Confirming Exemption from the Plan

Project proponents seeking permits from a local jurisdiction for activities that would otherwise be covered will need to demonstrate that the project is not a covered activity per the criteria in Chapter 2. Project proponents will need to:

1. demonstrate the size of the project;
2. show that the project is located in an area in **Figure 6-8** where private development is not subject to the Plan;
3. provide a map consistent with the requirements in Section 6.8.3 *Item 3: Land Cover Types on Site* showing that no serpentine, wetland, stream, riparian, or pond land cover types are present on the site;
4. demonstrate that no adverse indirect impacts to wetlands were identified through the applicable environmental review process; and
5. demonstrate that the project is not located in occupied nesting habitat for western burrowing owl based on the most recent western burrowing owl occupied nesting habitat map provided by the Implementing Entity.



**Table 6-1.** Covered Activities Exempt from Plan Conditions and/or Plan Fees

Covered Activity	Exemptions from Conditions (✓ = exempt)					Development Fees <sup>1</sup>
	All Chapter 6 Conditions	Wildlife Species Surveys (Conditions 15–18)	Preconstruction Surveys (Conditions 15–18)	Construction Monitoring (Conditions 15–18)	Covered Plant Surveys (Condition 20)	
<i>Public Activities</i>						
Routine infrastructure maintenance by public agencies within the planning limit of urban growth that do not affect stream, riparian, serpentine, ponds, or wetland land cover types.	✓	✓	✓	✓	✓	
Routine infrastructure maintenance by public agencies that occurs in urban-suburban, landfill, reservoir, or agriculture developed land cover types that do not affect stream, riparian, serpentine, pond, or wetland cover types. Examples of such activities include filling pot-holes and resurfacing existing roads without expansion of the paved area.	✓	✓	✓	✓	✓	
<i>Private Activities</i>						
Projects that do not result in ground disturbance, do not result in release of potential water quality contaminants, or do not create new wildlife barriers.	✓	✓	✓	✓	✓	
Private-sector, routine-maintenance activities that require a development, grading, or building permit, and that occur inside the Urban Service Area <sup>2</sup> .	✓	✓	✓	✓	✓	
Private-sector, routine-maintenance activities that require a development, grading, or building permit; that occur outside of the Urban Service Area; and that occur within 50 feet of all existing structures at the time of Plan commencement or within 50 feet of structures that are permitted for incidental take under the Habitat Plan.	✓	✓	✓	✓	✓	
Additions to existing structures, or new structures that are within 50 feet of an existing structure (e.g., a new garage) that result in less than 5,000 square feet of impervious surface as long as no stream, riparian woodland, wetlands, ponds, or serpentine land cover type are affected <sup>3</sup> .	✓	✓	✓	✓	✓	✓

Table 6-1. Continued

Covered Activity	Exemptions from Conditions (✓ = exempt)					Development Fees <sup>1</sup>
	All Chapter 6 Conditions	Wildlife Species Surveys (Conditions 15–18)	Preconstruction Surveys (Conditions 15–18)	Construction Monitoring (Conditions 15–18)	Covered Plant Surveys (Condition 20)	
Any covered activity described in Chapter 2 that occurs in urban-suburban, landfill, reservoir, or agriculture developed land cover types as verified in the field, unless the activity may affect a mapped or unmapped stream, riparian, serpentine, ponds, or wetland land cover types, or the activity is located in a stream setback.	✓	✓	✓	✓	✓	
A covered activity on a parcel of less than 0.5 acre or less as long as no serpentine, stream, riparian woodland, pond, or wetland land cover type is within the parcel.	✓	✓	✓	✓	✓	
Covered operations or maintenance activities, including those on the Reserve System, that do not result in any ground disturbance or removal of natural land cover types.		✓	✓	✓		
Covered operations or maintenance activities that occur more than once annually within the same location, as long as applicable surveys are conducted once before initiating the activity and there are negative survey results <sup>4,5</sup> .		✓	✓	✓		
Covered activities that occur entirely on one or more of the following land cover types: coyote brush scrub, reservoir, stream (i.e., riverine) where no riparian or wetland vegetation occurs, agricultural developed <sup>6</sup> , urban-suburban, rural-residential, or ornamental woodland.		✓	✓	✓		
Covered activities that occur entirely on one or more of the following land cover types: willow riparian forest and scrub, redwood forest, coastal and valley freshwater marsh, pond, orchard, vineyard, grain, row crop, hay and pasture, disked/short-term fallowed, golf courses/urban parks or barren.					✓	
Urban development covered activities (see Section 2.3.2 <i>Urban Development</i> in Chapter 2) in Zones A, B, or C on parcels less than 0.5 acre as long as the parcel does not contain or is not adjacent to a stream, riparian woodland or forest, wetland, pond, or serpentine land cover type <sup>8</sup> .						✓

Table 6-1. Continued

Covered Activity	Exemptions from Conditions (✓ = exempt)					
	All Chapter 6 Conditions	Wildlife Species Surveys (Conditions 15– 18)	Preconstruction Surveys (Conditions 15– 18)	Construction Monitoring (Conditions 15–18)	Covered Plant Surveys (Condition 20)	Development Fees <sup>1</sup>
All development that occurs on land mapped by the Habitat Plan as “urban-suburban”, “landfill”, “reservoir”, or “agriculture developed” land cover types if it is not located in or adjacent to a parcel that contains a stream, riparian woodland or forest, wetland, or serpentine land cover type <sup>9, 10</sup> .						✓
Construction of recreational facilities within the Reserve System <sup>11</sup> .						✓

## Notes:

<sup>1</sup> Does not include the Nitrogen Fee. See Chapter 9 for a complete discussion of all Development Fees.

<sup>2</sup> Private-sector activities that do not require a development, grading, or building permit are not subject to the Plan or its conditions or fees.

<sup>3</sup> Additions are cumulative and must be calculated based on the footprint of the structure at time of Plan implementation to determine whether this threshold has been crossed.

<sup>4</sup> Such activities are likely to result in repeated disturbance that will preclude establishment or persistence of the covered wildlife species targeted by these surveys.

<sup>5</sup> If surveys identify covered species, subsequent surveys must be conducted.

<sup>6</sup> The land cover type “agriculture developed” (also known as agriculture developed/covered ag) is defined in Chapter 3 as intensive agricultural operations such as nurseries and greenhouses.

<sup>7</sup> These land cover types do not support any of the covered species for which surveys are required.

<sup>8</sup> If new vehicle trips are generated, the nitrogen deposition fee may be assessed.

<sup>9</sup> The category “reservoir” excludes dams, which are subject to Habitat Plan fees.

<sup>10</sup> Barns, corrals, ranch homes, and other small patches of existing development were not mapped as these four exempt land cover types because they fell below the 10-acre minimum mapping unit. These sites would also be exempt from the same development fees as long as project proponents demonstrate that they were existing at the time of Plan adoption through air photos or other documentation.

<sup>11</sup> Instead of paying a fee for construction of infrastructure within the Reserve System, new disturbance for infrastructure does not count toward land cover type land acquisition requirements in Chapter 5, but it does count toward the total Reserve System size requirements.

**Table 6-2.** Aquatic Avoidance and Minimization Measures

ID	Avoidance and Minimization Measure
	<b>General</b>
1	Minimize the potential impacts on covered species most likely to be affected by changes in hydrology and water quality.
2	Reduce stream pollution by removing pollutants from surface runoff before the polluted surface runoff reaches local streams.
3	Maintain the current hydrograph and, to the extent possible, restore the hydrograph to more closely resemble predevelopment conditions.
4	Reduce the potential for scour at stormwater outlets to streams by controlling the rate of flow into the streams.
5	Invasive plant species removed during maintenance will be handled and disposed of in such a manner as to prevent further spread of the invasive species.
6	Activities in the active (i.e., flowing) channel will be avoided. If activities must be conducted in the active channel, avoidance and minimization measures identified in this table will be applied.
7	Personnel shall prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels.
8	Spill prevention kits shall always be in close proximity when using hazardous materials (e.g., crew trucks and other logical locations).
9	Personnel shall implement measures to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means when removing sediments from the streams.
10	<p>If ground disturbing activities are planned for a stream channel that is known or suspected to contain elevated levels of mercury, the following steps should be taken.</p> <ol style="list-style-type: none"> <li>1. Avoid disturbing soils in streams known or suspected to contain high levels of mercury.</li> <li>2. Soils that are likely to be disturbed or excavated shall be tested for mercury. Soils shall be remediated if: <ol style="list-style-type: none"> <li>a. disturbed or excavated soils exposed to flood flows below the 2.33-year channel flow level exceed 1 ppm Hg, or</li> <li>b. disturbed or excavated soils above the 2.33-year flow level exceed 20 ppm Hg.</li> </ol> </li> </ol>
11	Vehicles shall be washed only at approved areas. No washing of vehicles shall occur at job sites.
12	No equipment servicing shall be done in the stream channel or immediate flood plain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps, generators).
13	Personnel shall use the appropriate equipment for the job that minimizes disturbance to the stream bottom. Appropriately-tired vehicles, either tracked or wheeled, shall be used depending on the situation
14	If high levels of groundwater in a work area are encountered, the water is pumped out of the work site. If necessary to protect water quality, the water shall be directed into specifically constructed infiltration basins, into holding ponds, or onto areas with vegetation to remove sediment prior to the water re-entering a creek.



ID	Avoidance and Minimization Measure
15	<p>If native fish or non-covered, native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, a native fish and aquatic vertebrate relocation plan shall be implemented when ecologically appropriate as determined by a qualified biologist to ensure that significant numbers of native fish and aquatic vertebrates are not stranded.</p> <p>Prior to the start of work or during the installation of water diversion structures, native aquatic vertebrates shall be captured in the work area and transferred to another reach as determined by a qualified biologist. Timing of work in streams that supports a significant number of amphibians will be delayed until metamorphosis occurs to minimize impacts to the resource. Capture and relocation of aquatic native vertebrates is not required at individual project sites when site conditions preclude reasonably effective operation of capture gear and equipment, or when the safety of biologist conducting the capture may be compromised.</p> <p>Relocation of native fish or aquatic vertebrates may not always be ecologically appropriate. Prior to capturing native fish and/or vertebrates, the qualified biologist will use a number of factors, including site conditions, system carrying capacity for potential relocated fish, and flow regimes (e.g., if flows are managed) to determine whether a relocation effort is ecologically appropriate. If so, the following factors will be considered when selecting release site(s):</p> <ol style="list-style-type: none"> <li>1. similar water temperature as capture location;</li> <li>2. ample habitat availability prior to release of captured individuals;</li> <li>3. presence of other same species so that relocation of new individuals will not upset the existing prey/predation function;</li> <li>4. carrying capacity of the relocation location;</li> <li>5. potential for relocated individual to transport disease; and</li> <li>6. low likelihood of fish reentering work site or becoming impinged on exclusion net or screen.</li> </ol> <p>Proposals to translocate any covered species will be reviewed and approved by the Wildlife Agencies.</p>
16	<p>When work in a flowing stream is unavoidable, the entire streamflow shall be diverted around the work area by a barrier, except where it has been determined by a qualified biologist that the least environmentally disruptive approach is to work in a flowing stream. Where feasible, water diversion techniques shall allow stream flows to gravity flow around or through the work site.</p>
17	<p>Coffer dams shall be installed both upstream and downstream not more than 100 feet from the extent of the work areas. Coffer dam construction shall be adequate to prevent seepage into or from the work area. Stream flow will be pumped around the work site using pumps and screened intake hoses. All water shall be discharged in a non-erosive manner (e.g., gravel or vegetated bars, on hay bales, on plastic, on concrete, or in storm drains when equipped with filtering devices, etc.).</p>
18	<p>Small in-channel berms that deflect water to one side of the channel during project implementation may be constructed of channel material in channels with low flows.</p>
19	<p>Sumps or basins may also be used to collect water, where appropriate (e.g., in channels with low flows).</p>
20	<p>Diversions shall maintain ambient stream flows below the diversion, and waters discharged below the project site shall not be diminished or degraded by the diversion. All materials placed in the channel to dewater the channel shall be removed when the work is completed. Normal flows shall be restored to the affected stream as soon as is feasible and safe after completion of work at that location.</p>
21	<p>To the extent that stream bed design changes are not part of the project, the stream bed will be returned to as close to pre-project condition as appropriate.</p>
22	<p>To the extent feasible, all temporary diversion structures and the supportive material shall be removed no more than 48 hours after work is completed.</p>
23	<p>Temporary fills, such as for access ramps, diversion structures, or cofferdams, shall be completely removed upon finishing the work.</p>
24	<p>To prevent increases in temperature and decreases in dissolved oxygen (DO), if bypass pipes are used, they shall be properly sized (i.e., larger diameter pipes to better pass the flows). Use of bypass pipes may be avoided by creating a low-flow channel or using other methods to isolate the work area.</p>

ID	Avoidance and Minimization Measure
25	Diversions shall maintain fish passage when the project meets the following conditions: 1) the length of the area dewatered exceeds 500 feet, and/or 2) the length of time the stream is dewatered exceeds two weeks in length. Conditions for fish passage shall be met as long as the diversion 1) maintains contiguous flows through a low flow channel in the channel bed or an artificial open channel, 2) presents no vertical drops exceeding six (6) inches and follows the natural grade of the site, 3) maintains water velocities that shall not exceed eight feet per second (8 ft/sec), and 4) maintains adequate water depths consistent with normal conditions in the project reach. An artificial channel used for fish passage shall be lined with cobble/gravel. A closed conduit pipe shall not be used for fish passage. The inlets of diversions shall be checked daily to prevent accumulation of debris.
26	Any sediment removed from a project site shall be stored and transported in a manner that minimizes water quality impacts.
27	Sediment from the San Francisco Bay Watershed, including that for reuse, will not be removed to areas any farther south than Metcalf Road in south San Jose.
28	Where practical, the removed sediments and gravels will be re-used.
29	Existing native vegetation shall be retained by removing only as much vegetation as necessary to accommodate the trail clearing width. Maintenance roads should be used to avoid effects on riparian corridors.
30	Vegetation control and removal in channels, on stream banks, and along levees and maintenance roads shall be limited to removal necessary for facility inspection purposes, or to meet regulatory requirements or guidelines.
31	When conducting vegetation management, retain as much understory brush and as many trees as feasible, emphasizing shade producing and bank stabilizing vegetation.  If riparian vegetation is to be removed with chainsaws, consider using saws currently available that operate with vegetable-based bar oil.
32	In-channel vegetation removal may result in increased local erosion due to increased flow velocity. To minimize the effect, the top of the bank shall be protected by leaving vegetation in place to the maximum extent possible.
33	Regional Board objectives for temperature change in receiving waters (measured 100 feet downstream of discharge point) shall not be exceeded. Receiving water and discharge water may be monitored for temperature changes after a comparison of ambient temperature to pipeline water temperature suggests the potential for change.
<b>Project Design</b>	
34	Use the minimum amount of impermeable surface (building footprint, paved driveway, etc.) as practicable.
35	Use pervious materials, such as gravel or turf pavers, in place of asphalt or concrete to the extent practicable.
36	Use flow control structures such as swales, retention/detention areas, and/or cisterns to maintain the existing (pre-project) peak runoff.
37	Direct downspouts to swales or gardens instead of storm drain inlets.
38	Use flow dissipaters at runoff inlets (e.g., culvert drop-inlets) to reduce the possibility of channel scour at the point of flow entry.
39	Minimize alterations to existing contours and slopes, including grading the minimum area necessary.
40	Maintain native shrubs, trees and groundcover whenever possible and revegetate disturbed areas with local native or non-invasive plants.
41	Combine flow-control with flood control and/or treatment facilities in the form of detention/retention basins, ponds, and/or constructed wetlands.
42	Use flow control structures, permeable pavement, cisterns, and other runoff management methods to ensure no change in post-construction peak runoff volume from pre-project conditions for all covered activities with more than 5,000 square feet of impervious surface.
43	Site characteristics will be evaluated in advance of project design to determine if non-traditional designs, such as bioengineered bank treatments that incorporate live vegetation, can be successfully utilized while meeting the requirements of the project.
44	Maintenance of natural stream characteristics, such as riffle-pool sequences, riparian canopy, sinuosity, floodplain, and a natural channel bed, will be incorporated into the project design.

ID	Avoidance and Minimization Measure
45	Stream crossings shall incorporate a free-span bridge unless infeasible due to engineering or cost constraints or unsuitable based on minimal size of stream (swale without bed and banks or a very small channel). If a bridge design cannot free-span a stream, bridge piers and footings will be designed to have minimum impact on the stream. A hydraulics analysis must be prepared and reviewed by the jurisdictional partner, including SCVWD as appropriate, demonstrating that piers or footings will not cause significant scour or channel erosion. Whenever possible, the span of bridges will also allow for upland habitat beneath the bridge to provide undercrossing areas for wildlife species that will not enter the creek. Native plantings, natural debris, or scattered rocks will be installed under bridges to provide wildlife cover and encourage the use of crossings.
46	Whenever possible, the span of bridges will also allow for upland habitat beneath the bridge to provide undercrossing areas for wildlife species that will not enter the creek.
47	If a culvert is used, up- and downstream ends of the culvert must be appropriately designed so that the stream cannot flow beneath the culvert or create a plunge pool at the downstream end. Preference will be given to designs that allow a natural bottom (arch culvert) and/or which do not alter natural grade.
48	Trails will be sited and designed with the smallest footprint necessary to cross through the in-stream area. Trails will be aligned perpendicular to the channel and be designed to avoid any potential for future erosion. New trails that follow stream courses will be sited outside the riparian corridor.
49	The project or activity must be designed to avoid the removal of riparian vegetation, if feasible. If the removal of riparian vegetation is necessary, the amount shall be minimized to the amount necessary to accomplish the required activity and comply with public health and safety directives.
50	If levee reconstruction requires the removal of vegetation that provides habitat value to the adjacent stream (e.g., shading, bank stabilization, food sources, etc.), then the project will include replacement of the vegetation/habitat that was removed during reconstruction unless it is determined to be inappropriate to do so by the relevant resource agencies (e.g., CDFG and USFWS).
51	All projects will be conducted in conformance with applicable County and/or city drainage policies.
52	Adhere to the siting criteria described for the borrow site covered activity (see Chapter 2 for details).
53	When possible, maintain a vegetated buffer strip between staging/excavation areas and receiving waters.
54	When not within the construction footprint, deep pools within stream reaches shall be maintained as refuge for fish and wildlife by constructing temporary fencing and/or barrier so as to avoid pool destruction and prevent access from the project site.
55	For stream maintenance projects that result in alteration of the stream bed during project implementation, its low flow channel shall be returned to its approximate prior location with appropriate depth for fish passage without creating a potential future bank erosion problem.
56	Increased water velocity at bank protection sites may increase erosion downstream. Therefore, bank stabilization site design shall consider hydraulic effects immediately upstream and downstream of the work area. Bank stabilization projects will be designed and implemented to provide similar roughness and characteristics that may affect flows as the surrounding areas just upstream and downstream of the project site.
57	When parallel to a stream or riparian zone and not located on top of a levee, new trails shall be located behind the top of bank or at the outside edge of the riparian zone except where topographic, resource management, or other constraints or management objectives make this not feasible or undesirable.
58	Existing access routes and levee roads shall be used if available to minimize impacts of new construction in special status species habitats and riparian zones.
59	Trails in areas of moderate or difficult terrain and adjacent to a riparian zone shall be composed of natural materials or shall be designed (e.g., a bridge or boardwalk) to minimize disturbance and need for drainage structures, and to protect water quality.
60	Trail crossings of freshwater stream zones and drainages shall be designed to minimize disturbance, through the use of bridges or culverts, whichever is least environmentally damaging. Structures over water courses shall be carefully placed to minimize disturbance. Erosion control measures shall be taken to prevent erosion at the outfalls of drainage structures.

ID	Avoidance and Minimization Measure
<b>Construction</b>	
61	Minimize ground disturbance to the smallest area feasible.
62	Use existing roads for access and disturbed area for staging as site constraints allow. Off-road travel will avoid sensitive communities such as wetlands and known occurrences of covered plants.
63	Prepare and implement sediment erosion control plans.
64	No winter grading unless approved by City Engineer and specific erosion control measures are incorporated.
65	Control exposed soil by stabilizing slopes (e.g., with erosion control blankets) and protecting channels (e.g., using silt fences or straw wattles).
66	Control sediment runoff using sandbag barriers or straw wattles.
67	No stockpiling or placement of erodible materials in waterways or along areas of natural stormwater flow where materials could be washed into waterways.
68	Stabilize stockpiled soil with geotextile or plastic covers.
69	Maintain construction activities within a defined project area to reduce the amount of disturbed area.
70	Only clear/prepare land which will be actively under construction in the near term.
71	Preserve existing vegetation to the extent possible.
72	Equipment storage, fueling and staging areas will be sited on disturbed areas or non-sensitive habitat outside of a stream channel.
73	Avoid wet season construction.
74	Stabilize site ingress/egress locations.
75	Dispose of all construction waste in designated areas and prevent stormwater from flowing onto or off of these areas.
76	Prevent spills and clean up spilled materials.
77	Sweep nearby streets at least once a day.
78	In-stream projects occurring while the stream is flowing must use appropriate measures to protect water quality, native fish and covered wildlife species at the project site and downstream of the project site.
79	If mercury contamination may be present, the channel must be dewatered prior to commencement of the activity.
80	All personnel working within or adjacent to the stream setback (i.e., those people operating ground-disturbing equipment) will be trained by a qualified biologist in these avoidance and minimization measures and the permit obligations of project proponents working under this Plan.
81	Temporary disturbance or removal of aquatic and riparian vegetation will not exceed the minimum necessary to complete the work.
82	Channel bed temporarily disturbed during construction activities will be returned to pre-project or ecologically improved conditions at the end of construction.
83	Sediments will be stored and transported in a manner that minimizes water quality impacts. If soil is stockpiled, no runoff will be allowed to flow back to the channel.
84	Appropriate erosion control measures (e.g., fiber rolls, filter fences, vegetative buffer strips) will be used on site to reduce siltation and runoff of contaminants into wetlands, ponds, streams, or riparian vegetation. Fiber rolls used for erosion control will be certified as free of noxious weed seed. Filter fences and mesh will be of material that will not entrap reptiles and amphibians. Erosion control measures will be placed between the outer edge of the buffer and the project site.
85	Seed mixtures applied for erosion control will not contain invasive nonnative species and will be composed of native species or sterile nonnative species. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives.
86	Topsoil removed during soil excavation will be preserved and used as topsoil during revegetation when it is necessary to conserve the natural seed bank and aid in revegetation of the site.
87	Vehicles operated within and adjacent to streams will be checked and maintained daily to prevent leaks of materials that, if introduced to the water, could be deleterious to aquatic life.

ID	Avoidance and Minimization Measure
88	Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas.
89	The potential for traffic impacts on terrestrial animal species will be minimized by adopting traffic speed limits.
90	All trash will be removed from the site daily to avoid attracting potential predators to the site. Personnel will clean the work site before leaving each day by removing all litter and construction-related materials.
91	To prevent the spread of exotic species and reduce the loss of native species, aquatic species will be netted at the drain outlet when draining reservoirs or ponds to surface waters. Captured native fish, native amphibians, and western pond turtles will be relocated if ecologically appropriate. Exotic species will be dispatched.
92	To minimize the spread of pathogens all staff working in aquatic systems (i.e., streams, ponds, and wetlands)—including site monitors, construction crews, and surveyors—will adhere to the most current guidance for equipment decontamination provided by the Wildlife Agencies at the time of activity implementation. Guidance may require that all materials that come in contact with water or potentially contaminated sediments, including boot and tire treads, be cleaned of all organic matter and scrubbed with an appropriate cleansing solution, and that disposable gloves be worn and changed between handling equipment or animals. Care should be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.
93	When accessing upland areas adjacent to riparian areas or streams, access routes on slopes of greater than 20% should generally be avoided. Subsequent to access, any sloped area should be examined for evidence of instability and either revegetated or filled as necessary to prevent future landslide or erosion.
94	Personnel shall use existing access ramps and roads if available. If temporary access points are necessary, they shall be constructed in a manner that minimizes impacts to streams.
95	To prevent inadvertent entrapment of animals during excavation, all excavated, steep-walled holes or trenches more than 2-feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks.
96	Isolate the construction area from flowing water until project materials are installed and erosion protection is in place.
97	Erosion control measures shall be in place at all times during construction. Do not start construction until all temporary control devices (straw bales, silt fences, etc.) are in place downstream of project site.
98	When needed, utilize in-stream grade control structures to control channel scour, sediment routing, and headwall cutting.
<b>Post-Construction</b>	
99	Conduct street cleaning on a regular basis
100	Potential contaminating materials must be stored in covered storage areas or secondary containment that is impervious to leaks and spills
101	Runoff pathways shall be free of trash containers or trash storage areas. Trash storage areas shall be screened or walled
102	Immediately after project completion and before close of seasonal work window, stabilize all exposed soil with mulch, seeding, and/or placement of erosion control blankets .
103	All disturbed soils will be revegetated with native plants and/or grasses or sterile nonnative species suitable for the altered soil conditions upon completion of construction. Local watershed native plants will be used if available. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives. All disturbed areas that have been compacted shall be de-compacted prior to planting or seeding. Cut-and-fill slopes will be planted with local native or non-invasive plants suitable for the altered soil conditions.
104	Measures will be utilized on site to prevent erosion along streams (e.g., from road cuts or other grading), including in streams that cross or are adjacent to the project proponent's property. Erosion control measures will utilize natural methods such as erosion control mats or fabric, contour wattling, brush mattresses, or brush layers. For more approaches and detail, please see the <i>Bank Protection/ Erosion Repair Design Guide</i> in the Santa Clara Valley Water Resources Protection Collaborative's <i>User Manual: Guidelines &amp; Standards for Land Use Near Streams</i> (Santa Clara Valley Water Resources Protection Collaborative 2006).

ID	Avoidance and Minimization Measure
105	Vegetation and debris must be managed in and near culverts and under and near bridges to ensure that entryways remain open and visible to wildlife and that passage through the culvert or bridge remains clear.
106	Prior to undertaking stream maintenance activities, reach conditions will be assessed to identify tasks that are necessary to maintain the channel for the purpose for which it was designed and/or intended (e.g., flood control, groundwater recharge). Only in-stream work that is necessary to maintain the channel will be conducted.
107	On streams managed for flood control purposes, when stream reaches require extensive vegetation thinning or removal (e.g., when the channel has been fully occluded by willows or other vegetation), removal will be phased so that some riparian land cover remains and provides some habitat value. In addition, vegetation removal will be targeted and focused on removing the least amount of riparian vegetation as possible while still meeting the desired flood control needs. For example, vegetation removal should be focused on shrubby undergrowth at the toe-of-slope that is most likely to increase roughness and create a flooding hazard. Vegetation on the upper banks, particularly mature tree canopy, should be maintained to the extent possible to provide habitat for birds and small mammals and shading for the active channel.
108	When reaches require sediment removal, approaches will be considered that may reduce the impacts of the activity. Examples of potential approaches include phasing of removal activities or only removing sediment along one half of the channel bed, allowing the other half to remain relatively undisturbed.
109	In streams not managed for flood control purposes, woody material (including live leaning trees, dead trees, tree trunks, large limbs, and stumps) will be retained unless it is threatening a structure, impedes reasonable access, or is causing bank failure and sediment loading to the stream.
110	If debris blockages threaten bank stability and may increase sedimentation of downstream reaches, debris will be removed. When clearing natural debris blockages (e.g., branches, fallen trees, soil from landslides) from the channel, only remove the minimum amount of debris necessary to maintain flow conveyance (i.e., prevent significant backwatering or pooling). Non-natural debris (e.g., trash, shopping carts, etc.) will be fully removed from the channel.
111	If bank failure occurs due to debris blockages, bank repairs will only use compacted soil, and will be re-seeded with native grasses or sterile nonnative hybrids and stabilized with natural erosion control fabric. If sterile nonnative species are used for temporary erosion control, native seed mixtures must be used in subsequent treatments to provide long-term erosion control and slow colonization by invasive nonnatives. If compacted soil is not sufficient to stabilize the slope, bioengineering techniques must be used. No hardscape (e.g., concrete or any sort of bare riprap) or rock gabions may be utilized in streams not managed for flood control except in cases where infrastructure or human safety is threatened (e.g., undercutting of existing roads). Rock riprap may only be used to stabilize channels experiencing extreme erosion, and boulders must be backfilled with soil and planted with willows or other native riparian species suitable for planting in such a manner. If available, local native species will be utilized as appropriate.
112	Pumps and generators shall be maintained and operated in a manner that minimizes impacts to water quality and aquatic species.
113	The channel bottom shall be re-graded at the end of the work project to as close to original conditions as possible.
114	Erosion control methods shall be used as appropriate during all phases of routine maintenance projects to control sediment and minimize water quality impacts.
115	All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for wildlife by properly trained construction personnel before the pipe is subsequently buried, capped, or otherwise used or moved in anyway.

**Table 6-3.** Conditions on Covered Transportation Projects

Design Requirements and Construction Practices	Highway Projects	Roadway Projects <sup>1</sup> and Interchange Upgrades	Mass Transit Projects	Road Safety and Operational Improvements	Dirt Road Construction
<b>Transportation Project Design Requirements</b>					
Background data collection by Habitat Plan Implementing Entity	R	R	R	–	–
Design coordination with Wildlife Agencies <sup>2</sup>	R	R	R	–	–
Enhance existing undercrossings	R	R	R	R	–
• Implement minimum sizing of culverts	R	R	R	R	–
• Install grating over tunnels/culverts for light penetration	P	P	P	P	–
• Install fencing around undercrossings to maximize crossing use	R	R	R	R	–
Road or rail barrier and passage designs for wildlife (to direct wildlife to safe crossings)	R	P	R	R	–
<b>Construction Practices</b>					
Avoidance and minimization measures	R	R	R	R	R
<b>Post-Construction Practices</b>					
Control roadside vegetation adjacent to reserves	R	R	R	R	R
Revegetate cut/fill slopes with native vegetation	R	R	R	R	R
Vegetation management around undercrossings	R	R	R	R	R
Notes:					
R = Required					
P = Possible (required unless data demonstrate action would not benefit wildlife and CDFG and USFWS agree to omit).					
<sup>1</sup> Major roadway projects are identified in Table 2-6 and include those projects most likely to adversely affect habitat linkages in the study area.					
<sup>2</sup> The scope of this review will be limited to the design, location, and extent of the median barrier.					

**Table 6-4. Rural Road Maintenance Avoidance and Minimization Measures**

		Sediment Management and Erosion Control							Road Maintenance									
		General Construction	Hillside Activities	Spoils Handling and Disposal	Mass Wasting Repair	Minor Slide Repair	Storm-Proofing	Culverts	General	Shoulder Maintenance	Dirt Road Maintenance	Ditch Maintenance	Drainage Systems	Sidcasting	Water Drafting	Vegetation Management	Dust Control	Concrete Work
Avoidance and Minimization Measures																		
1	Incorporate erosion control into the planning, construction and follow up phases for all road activities.	X	X	X		X	X	X	X	X	X	X	X	X		X		
2	If working during times when rain might be possible, always have erosion control measures onsite in case of a storm event.	X	X	X		X	X	X	X	X	X	X	X	X				
3	Plan for projects involving disturbance of soil (earthwork) within the riparian setback to occur during the salmonid avoidance season (June 15–October 15) with the exception of emergency or public safety related projects (e.g., clearing a landslide across a road). If avoidance is not possible, utilize appropriate avoidance and minimization measures as described in Conditions 4 and 5.	X	X	X		X	X	X	X	X	X	X	X	X		X		X
4	Set up the work and staging area to minimize the area of soil that will be disturbed and the tracking of soil out of the work area by vehicles and equipment.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	When possible, avoid staging projects in areas where runoff will be concentrated.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Do not stage maintenance equipment in riparian areas or adjacent to streams with the exception of emergency or public safety related projects where no other staging options exist. Avoidance and minimization measures described in Conditions 4 and 5 will be applied as appropriate.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	Use appropriate erosion and sediment control avoidance and minimization measures to secure the staging and project area so that sediment runoff is avoided. Avoidance and minimization measures described in Conditions 4 and 5 will be applied as appropriate.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	Protect storm drain inlets and watercourses using appropriate avoidance and minimization measures. Avoidance and minimization measures described in Conditions 4 and 5 will be applied as appropriate.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9	Mulch or revegetate bare soil adjacent to stream channels, or other flow transport paths, to the break-in-slope near those areas.	X	X	X	X	X			X	X		X	X			X		



**Table 6-4. Continued**[illegible]

**Table 6-4. Continued**[illegible]

Table 6-4. Continued

		Sediment Management and Erosion Control							Road Maintenance									
		General Construction	Hillside Activities	Spoils Handling and Disposal	Mass Wasting Repair	Minor Slide Repair	Storm-Proofing	Culverts	General	Shoulder Maintenance	Dirt Road Maintenance	Ditch Maintenance	Drainage Systems	Sidecasting	Water Drafting	Vegetation Management	Dust Control	Concrete Work
Avoidance and Minimization Measures																		
29	Avoid disturbance of vegetation outside the essential shoulder area, especially near ditches, streams or watercourses. These vegetated areas help filter sediment from water run-off into ditches or streams and helps prevent erosion.	X							X							X		
30	Grade ditches only when necessary to keep the ditchline free flowing and restore capacity. Unnecessary mechanical grading can cause excess erosion, undermine banks, and expose the toe of the cutslope to erosion or slope failure.											X	X					
31	To control vegetation (rather than remove it entirely), use methods like mowing or weed-whacking when feasible. Vegetation prevents scour and filters out sediment.		X						X			X				X		
32	Whenever feasible, maintain a buffer of vegetation between the ditch and the road. This helps filter sediment from runoff and can be accomplished by using a steeper angle on the grader blade.	X	X						X			X				X		
33	Avoid harming existing vegetation on the cutbank above the ditch to reduce erosion and prevent slope failure.	X	X				X		X			X						
34	When “pulling” a ditch (mechanically grading and removing fine sediment), when possible, avoid spreading ditch spoils across or into the surface rock of the road or shoulder. Consider incorporating the removed soil into localized infrastructure (e.g., trails) and compact soil in place.											X						
35	The recommended minimum diameter for all new culverts, including cross drains, but exclusive of driveway culverts, is 18 inches. Often, small diameter culverts (12 inches or less) plug with debris, causing significant road damage. They are also difficult to clean out.	X						X	X				X					

**Table 6-4. Continued**[illegible]

Table 6-4. Continued

		Sediment Management and Erosion Control							Road Maintenance									
		General Construction	Hillside Activities	Spoils Handling and Disposal	Mass Wasting Repair	Minor Slide Repair	Storm-Proofing	Culverts	General	Shoulder Maintenance	Dirt Road Maintenance	Ditch Maintenance	Drainage Systems	Sidecasting	Water Drafting	Vegetation Management	Dust Control	Concrete Work
Avoidance and Minimization Measures																		
41	Designate areas to be used for concrete washout and perform washout only in properly constructed containments. When washing equipment or vehicles to remove cement or concrete residue, use only as much water as is needed so that rinse water can be properly contained. For example, use a positive shutoff on the washout hose.																	X
42	Follow these procedures for concrete mixing on site. - Ensure that contractors who fuel and operate cement mixing operations on site have an adequate spill plan and materials for spill containment. - Avoid mixing excess amounts of fresh concrete or cement on site. - Establish mixing plants outside of riparian corridors or near watercourses. - Dry and wet materials should be stored away from waterways and storm drains and should be covered and contained to prevent runoff from rainfall.																	X
43	Remove concrete grindings, rubble, and debris from the site for proper disposal and do not discharge into drain inlets, the storm water drainage system or watercourses.																	X
44	Contain coolant water from concrete cutting and do not discharge into drain inlets, the storm water drainage system or watercourses.																	X
45	When fresh concrete may be exposed to water, (e.g. rainy weather work), use concrete sealants that are approved by the California Department of Fish and Game for this purpose.																	X
46	Perform all in-stream work in dry conditions, and do not work in flowing waters. If a stream is flowing, use a cofferdam or other dewatering avoidance and minimization measures as needed. See Condition 4 for dewatering avoidance and minimization measures.	X						X	X				X					

Table 6-4. Continued

		Sediment Management and Erosion Control							Road Maintenance									
		General Construction	Hillside Activities	Spoils Handling and Disposal	Mass Wasting Repair	Minor Slide Repair	Storm-Proofing	Culverts	General	Shoulder Maintenance	Dirt Road Maintenance	Ditch Maintenance	Drainage Systems	Sidecasting	Water Drafting	Vegetation Management	Dust Control	Concrete Work
Avoidance and Minimization Measures																		
47	Identify and map existing permanent disposal sites that can be used for long-term disposal of materials from routine and emergency maintenance activities and provide this information to maintenance crews. These sites should be in upland areas, such as rock pits, ridges, and benches. Locations should be above the 100-year floodplain of the closest stream and away from any groundwater seeps or wetlands.			X	X				X									
48	Minimize disturbance of ground cover or grass on the shoulder to the extent possible (the shoulder is part of the road right-of-way and may need to be kept clear for safety purposes), near ditches and outside of the road right-of-way. If the ground is bladed clean during mowing, the exposed soil will be vulnerable to erosion and could run-off into a creek. Vegetation can also act as a pollution filter that traps sediment and other runoff before it gets into ditches or streams.															X		
49	General guidelines for working within the road right-of-way: - Do not mow beyond 8 feet from the edge of the pavement unless that vegetation must be removed to retain existing drainage patterns or for safety reasons. - Do not remove brush more than 20 feet on either side of the road at bridge structures, unless additional removal is required to address safety concerns or to control noxious weeds. - Do not remove brush more than 10 feet on either side of a culvert, or 10 feet up and downstream from culverts that are 6-feet in diameter or larger, unless management is required for safety concerns or to control noxious weeds. NOTE: Fire management requirements must be considered when using this avoidance and minimization measure.							X	X	X						X		

**Table 6-4. Continued**[illegible]

**Table 6-5.** Habitat for Covered Species Avoided due to the Stream and Riparian Setback Condition

Species/Modeled Habitat	Total Modeled Habitat in Study Area <sup>1</sup>	Amount in Open Space Types 1, 2, and 3 <sup>2</sup>	Commitment to Acquire Modeled Habitat for Reserve System <sup>1</sup>	Additional Modeled Habitat Avoided due to Setbacks <sup>3</sup>	Percent of Modeled Habitat Avoided due to Setbacks
California red-legged frog					
Primary habitat (acres)	10,101	3,230	1,300	2,855	28%
Foothill yellow-legged frog					
Primary habitat (miles)	244	70	30	119	49%
Secondary habitat (miles)	447	1526	50	229	51%
Western pond turtle					
Primary habitat (acres)	82,895	28,568	7,000	13,480	16%
Least Bell's vireo					
Primary habitat (acres)	3,097	330	460	837	55%

Notes:

<sup>1</sup> Source: **Table 5-17**.<sup>2</sup> Open space Types 1, 2, and 3 are assumed to provide some conservation value for covered species.<sup>3</sup> Excludes setbacks that could occur within the Reserve System and existing open space. Represents a reasonable estimate of avoidance during the permit term if all covered activities occurred. Estimate does not include setbacks from rural residential development, which are difficult to predict in locations precise enough to estimate setback distances.



**Table 6-6.** Recommended Setbacks to Preserve Riparian and Stream Function (from studies throughout the United States since 1990)

	Function	Citation	Recommended Setback
Physical Properties	<b>Sediment and Nutrient Reduction</b>	Corley et al. 1999	>33 feet
		Nichols et al. 1998	>60 feet
		Woodward and Rock 1995	>50 feet
		Desbonnet et al. 1994	80 feet
		Petersen et al. 1992	>33 feet
		Castelle et al. 1992	>50 feet
		Schellinger and Clausen 1992	75 feet
		Welsch 1991	>85 feet
Biological Properties	<b>Removal of Fecal Coliform</b>	Johnson and Ryba 1992*	75–300 feet
	<b>Moderation of Stream Temperature/Microclimate</b>	Lynch and Corbett 1990	100 feet
	<b>Channel Complexity</b>	Brosofske et al. 1997	>145 feet
		Chapel et al. 1991	135–220 feet
	<b>Salmonid Habitat</b>	Ligon et al. 1999	>150 feet
		Welsch 1991	>85 feet
	<b>Reptile/Amphibian Habitat</b>	Burbink et al. 1998	>325 feet
		Semlitsch 1998	540 feet
		Buhlmann 1998	440 feet
		Rudolph and Dickson 1990	98 feet
	<b>Bird Habitat/Diversity</b>	RHJV 2000	250 feet
		Whitaker and Montevechi 1999	>160 feet
		Hagar 1999	>130 feet
		Kilgo et al. 1998	>1,600 feet
		Richardson and Miller 1997	>160 feet
		Mitchell 1996	>325 feet
		Hodges and Krementz 1996	>325 feet
		Spackman and Hughes 1995	450 feet for 90% of species diversity
	<b>Mammal Habitat/Diversity</b>	Hilty et al. 2006	>1,000 feet
	<b>Plant Diversity</b>	Spackman and Hughes 1995	30–100 feet for 90% of species
	<b>General Riparian/Ecosystem Function</b>	NH FSSWT 2000	100 feet, 300 feet, 600 feet by stream order
		Spence et al. 1996	98–145 feet
		Johnson and Ryba 1992*	> 98 feet
		Chapel et al. 1991	160–650 feet
		Welsch 1991	>85 feet

\* Article does not present new data, but instead is a review of existing data.

**Table 6-7.** Required Stream Setback Distances<sup>1</sup>

Stream Category	Category 1 Streams		Category 2 Streams
	Inside Existing Urban Service Area <sup>2</sup>	Outside Existing Urban Service Area <sup>2</sup>	
Slope Class			
0–30%	100 feet	150 feet	35 feet
> 30%	150 feet	200 feet	

<sup>1</sup> All distances measured from top of bank. For Category 1 streams, if the edge of riparian vegetation extends beyond setback, the riparian edge becomes the setback plus a 35-foot buffer from riparian edge inside or outside the Urban Service Area. For Category 2 streams, if the site supports riparian vegetation, the setback will extend from the riparian edge plus a 35-foot buffer.

<sup>2</sup> Urban service areas existing at the time of permit issuance for the Habitat Plan.

**Table 6-8.** Summary of Habitat Survey Requirements and Preconstruction Survey and Monitoring for Select Covered Wildlife Species

Land Cover Type	Species	Specific Habitat Elements	Species Habitat Survey <sup>1</sup>	Preconstruction Survey	Requirements	
					Avoidance and Minimization Requirements	Construction Monitoring
Any Grassland, Oak Woodland, or Agricultural Land Cover Types	San Joaquin kit fox	<ul style="list-style-type: none"> <li>• Within the modeled habitat in the study area (see species account in Appendix D for model and parameters)</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and map potential den sites</li> </ul>	<ul style="list-style-type: none"> <li>• Determine status and map all dens (&gt;5 in. diameter) within 250 feet of activity footprint</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor dens</li> <li>• Destroy unoccupied dens</li> <li>• Discourage use of occupied (non-natal) dens</li> </ul>	<ul style="list-style-type: none"> <li>• Establish exclusion zones (&gt;50 feet) for potential dens</li> <li>• Establish exclusion zones (&gt;100 feet) for known dens</li> <li>• Notify USFWS and CDFG of any occupied natal dens</li> <li>• Construction or maintenance personnel must participate in training</li> </ul>
	Western burrowing owl	<ul style="list-style-type: none"> <li>• Within all occupied nesting habitat (<b>Figure 5-11</b>). Surveys are not required in sites that are mapped as potential nesting/overwintering or only overwintering habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and map burrows and potential burrows within 250 ft of activity footprint</li> <li>• Document evidence of presence/absence (owls, pellets, whitewash, prey remains)</li> <li>• Species survey in occupied habitat are required in both breeding and non-breeding</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct burrowing owl survey within 2 calendar days of ground disturbance (see Condition 15 for details of required survey methods)</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid occupied nests within a 250-foot buffer during breeding season (Feb 1–Aug 31) or develop a monitoring plan that allows activity within 250-foot buffer (see Condition 15 for requirements)</li> <li>• Avoid occupied burrows during non-breeding season (Sept 1–Jan 31) or meet requirements in Condition 15 if allowing activity within a 250-foot buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Establish buffer zones (250 feet) around active nests if applicable</li> <li>• Establish buffer zones (250 feet) around occupied burrows during non-breeding season if applicable</li> <li>• Implement construction monitoring consistent with monitoring plan or requirements if activities occur within the buffer</li> <li>• Construction or maintenance personnel must participate in training</li> </ul>

Table 6-8. Continued

Land Cover Type	Species	Specific Habitat Elements	Species Habitat Survey <sup>1</sup>	Requirements		
				Preconstruction Survey	Avoidance and Minimization Requirements	Construction Monitoring
Pond or Coastal/Valley Freshwater Marsh	Tricolored blackbird	<ul style="list-style-type: none"> <li>• Within 250 feet of verified riparian land, coastal and valley freshwater marsh, or pond cover types</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and map nesting substrate, and marsh habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Document presence/absence of breeding colony within 2 calendar days of disturbance</li> <li>• Document use of habitat (e.g., breeding, foraging)</li> <li>• Determine if the site has been used for nesting in the past 5 years</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid occupied nests colonies during breeding season (Mar 15–July 31)</li> <li>• Avoid nest sites that were occupied in the past 5 years</li> </ul>	<ul style="list-style-type: none"> <li>• Establish 250-foot buffer around outer edge of all hydric vegetation associated with breeding habitat</li> <li>• Construction or maintenance personnel must participate in training</li> <li>• Notify CDFG and USFWS of nest locations immediately</li> </ul>
Any Riparian Forest and Scrub Land Cover Types	Least Bell's vireo	<ul style="list-style-type: none"> <li>• Within potential breeding habitat, as mapped by the Implementing Entity</li> <li>• Within 250 feet of verified riparian land cover types</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and map early successional riparian forest or scrub</li> </ul>	<ul style="list-style-type: none"> <li>• Document presence/absence of nesting least Bell's vireo within 2 calendar days of disturbance</li> <li>• Document use of habitat (e.g., breeding, foraging)</li> <li>• Determine if the site has been used for nesting in the past 3 years</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid occupied nests during breeding season (Mar 15–July 31)</li> <li>• Avoid nest sites that were occupied in the past 3 years</li> </ul>	<ul style="list-style-type: none"> <li>• Establish a 250-foot buffer around occupied nest site</li> <li>• Construction or maintenance personnel must participate in training</li> <li>• Notify CDFG and USFWS of nest locations immediately</li> </ul>
Serpentine bunchgrass grassland	Bay checkerspot butterfly	<ul style="list-style-type: none"> <li>• In Bay checkerspot butterfly habitat units identified in Appendix D</li> <li>• In mapped serpentine that cannot be avoided</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and map extent of larval host plants</li> <li>• Report results of reconnaissance level surveys for adult butterflies</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Locate the project footprint as far from field-verified occupied Bay checkerspot habitat or the highest-quality serpentine habitat as feasible</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>

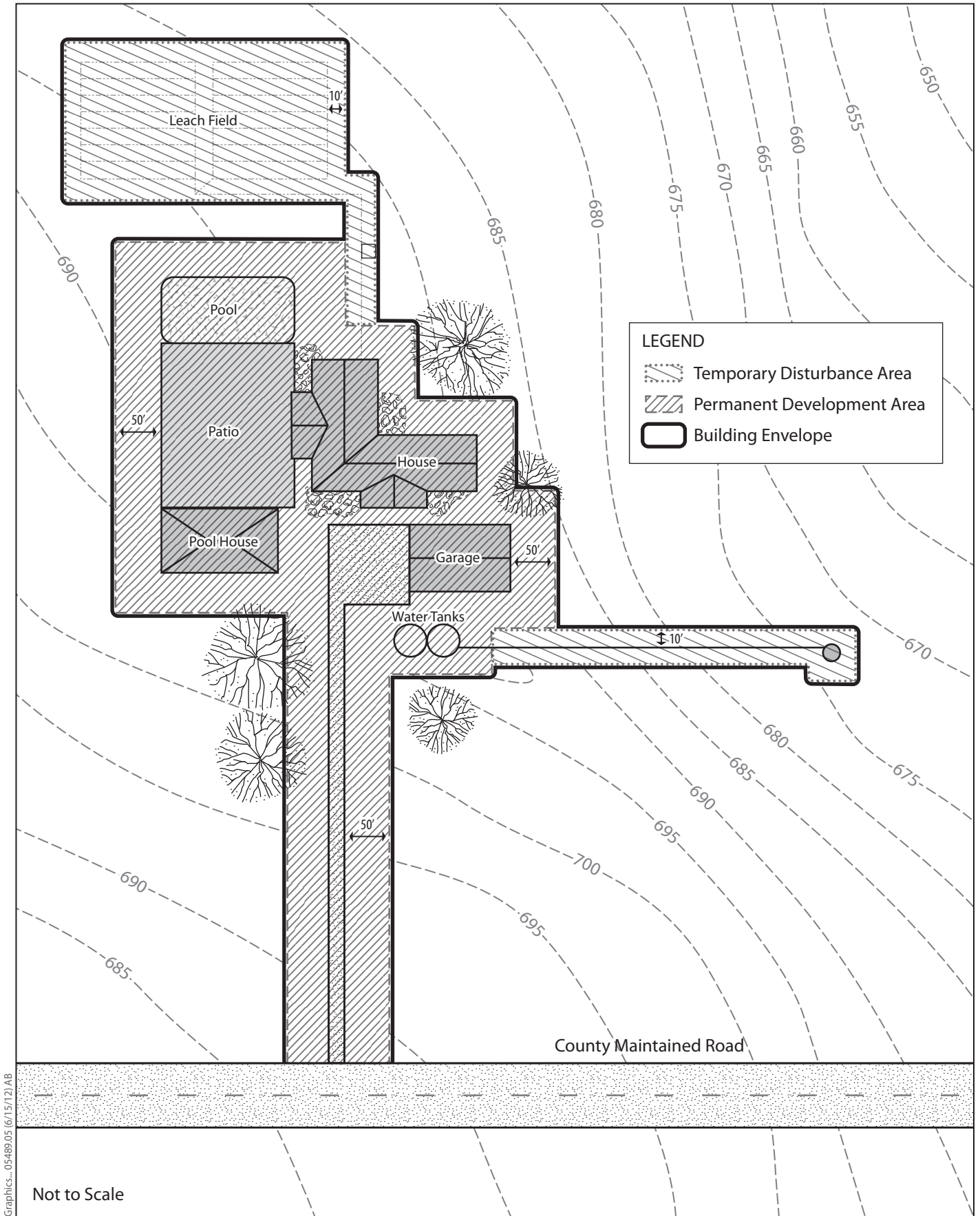
<sup>1</sup> Changes to project design that result from planning survey information will help avoid impacts to covered species. If no project design changes are needed and site is relatively simple, species habitat surveys could be combined with preconstruction surveys.

**Table 6-9.** Survey Periods for Covered Plant Species

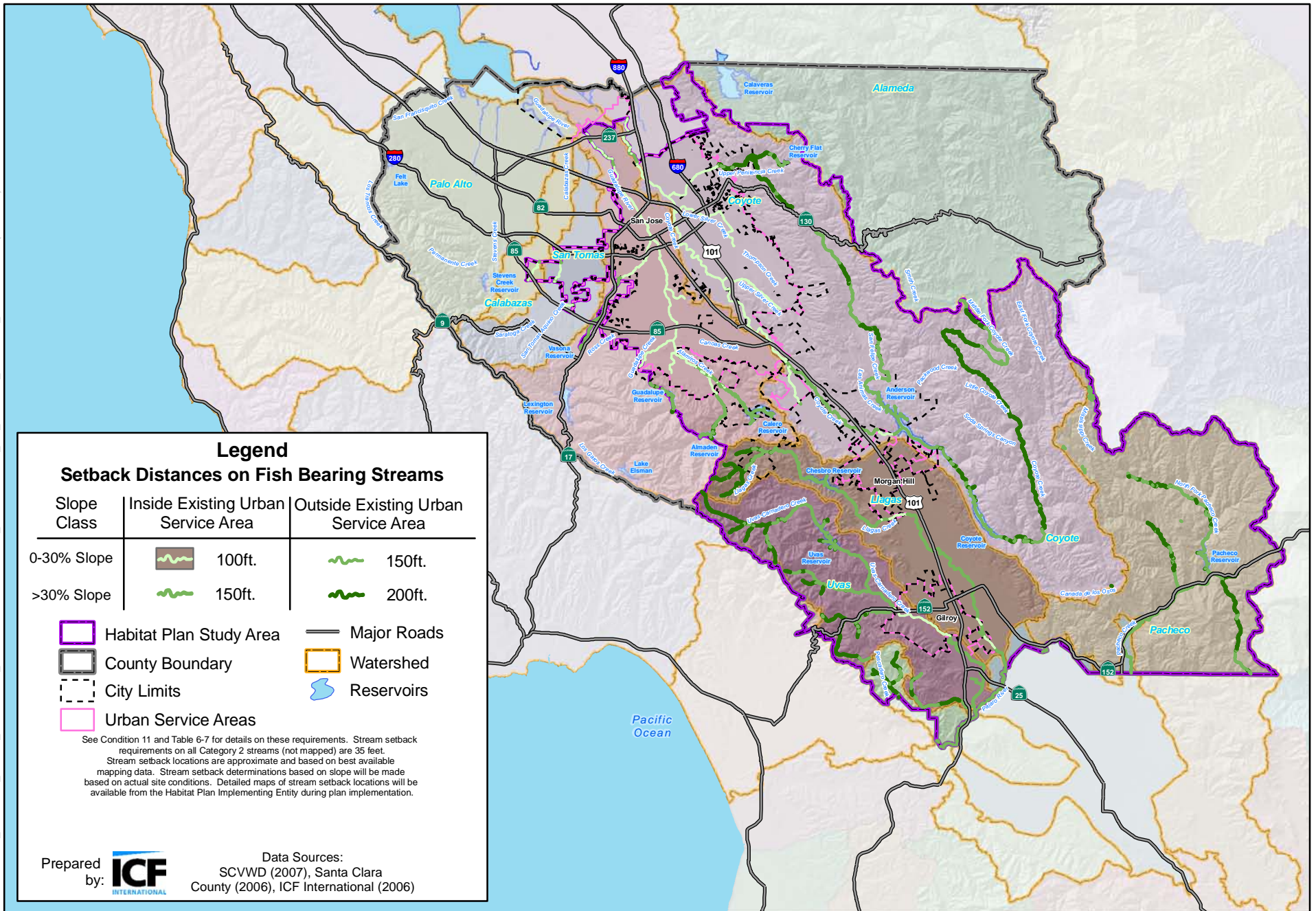
Species		Survey Period											
Common Name	Scientific Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
<b>Covered Species</b>													
Tiburon Indian paintbrush	<i>Castilleja affinis</i> ssp. <i>neglecta</i>				√	√	√	√					
Coyote ceanothus	<i>Ceanothus ferrisiae</i>	√	√	√	√	√							
Mount Hamilton thistle	<i>Cirsium fontinale</i> var. <i>campylon</i>		(√)	(√)	√	√	√	√	√	√	(√)		
Santa Clara Valley dudleya	<i>Dudleya abramsii</i> ssp. <i>setchellii</i>				√	√	√						
Fragrant fritillary	<i>Fritillaria liliacea</i>		√	√	√								
Loma Prieta hoita	<i>Hoita strobilina</i>					(√)	√	√	(√)	(√)	(√)		
Smooth lessingia	<i>Lessingia micradenia</i> var. <i>glabrata</i>							√	√	√	(√)	(√)	
Metcalf Canyon jewelflower	<i>Streptanthus albidus</i> ssp. <i>albidus</i>				√	√	√	√					
Most beautiful jewelflower	<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>			√	√	√	√						

Note: (√) indicates flowering periods which are possible but uncommon for the species.



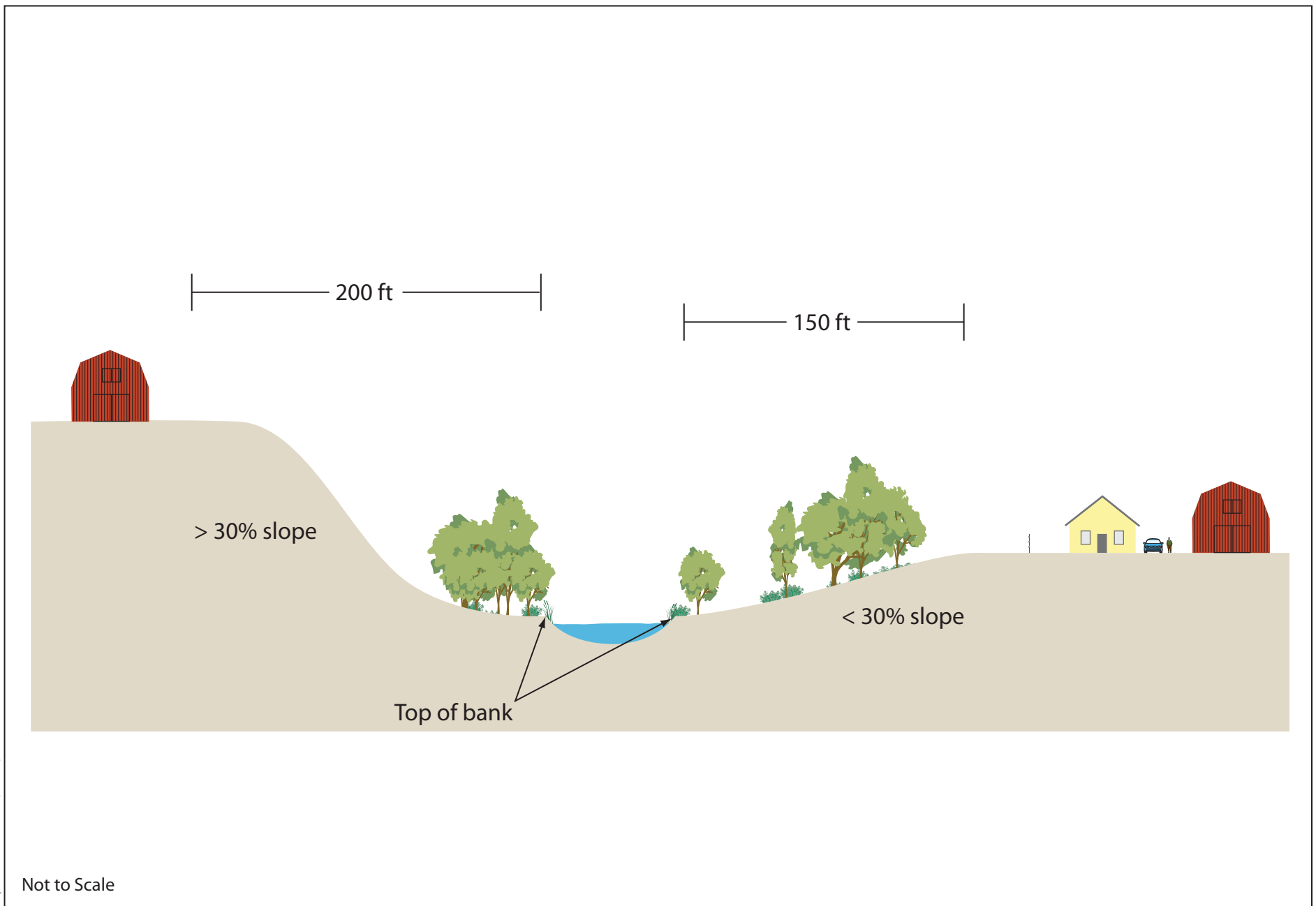


**Figure 6-1**  
**Schematic for Calculating Development Area**

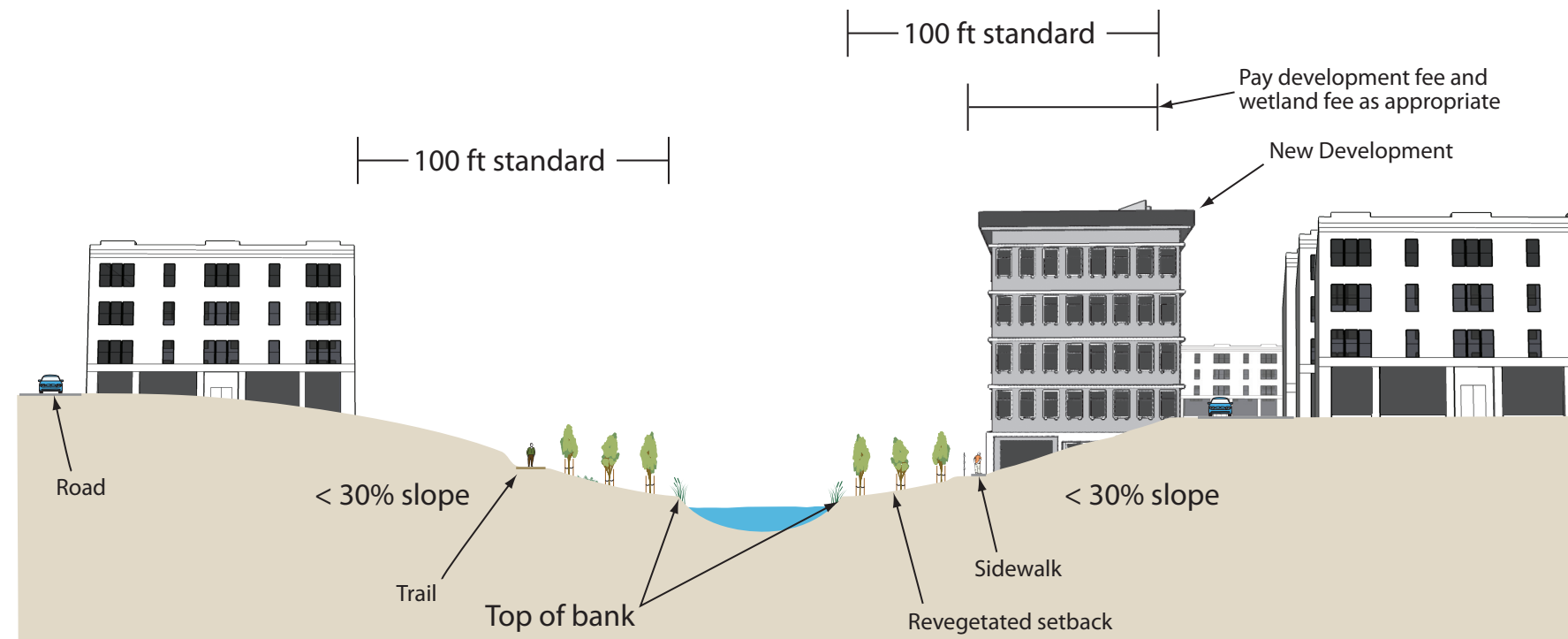


**Figure 6-2**  
**Stream Setback Requirements for Category 1 Streams**

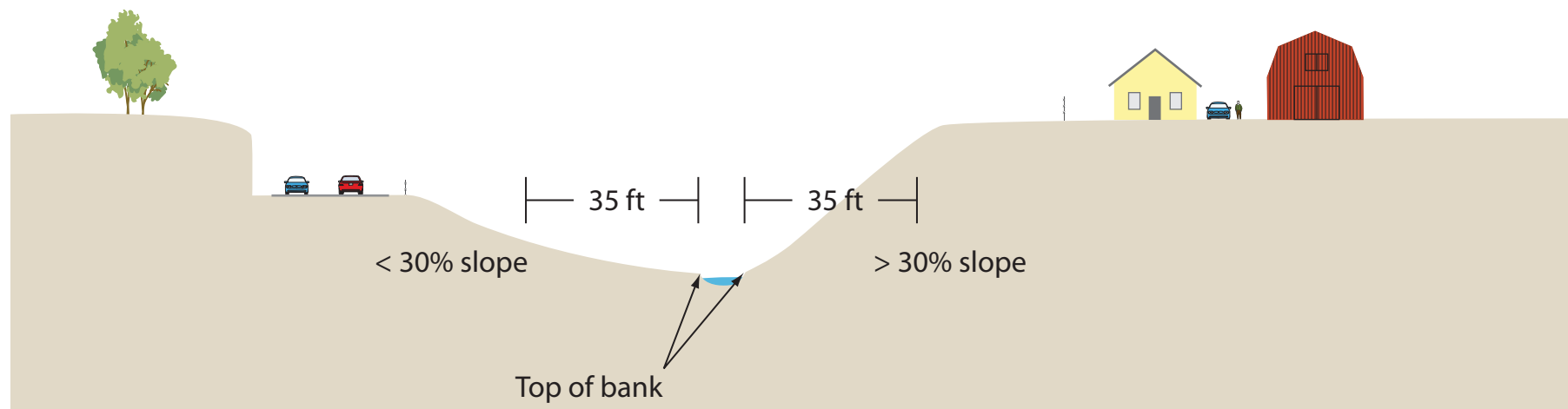




**Figure 6-3a**  
**Stream Setback Condition – Slope Examples**  
**Category 1 Stream Outside Urban Service Area**



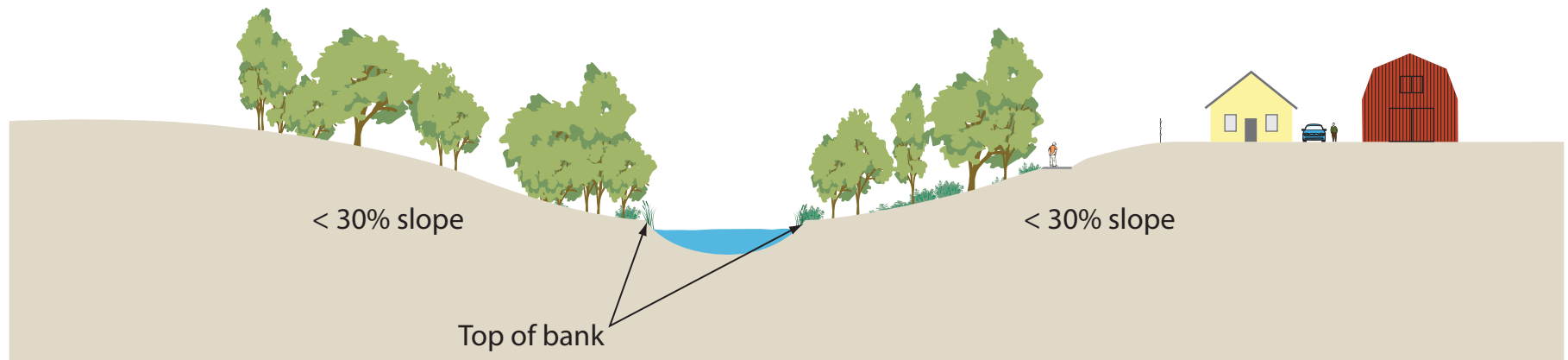
Not to Scale



Not to Scale

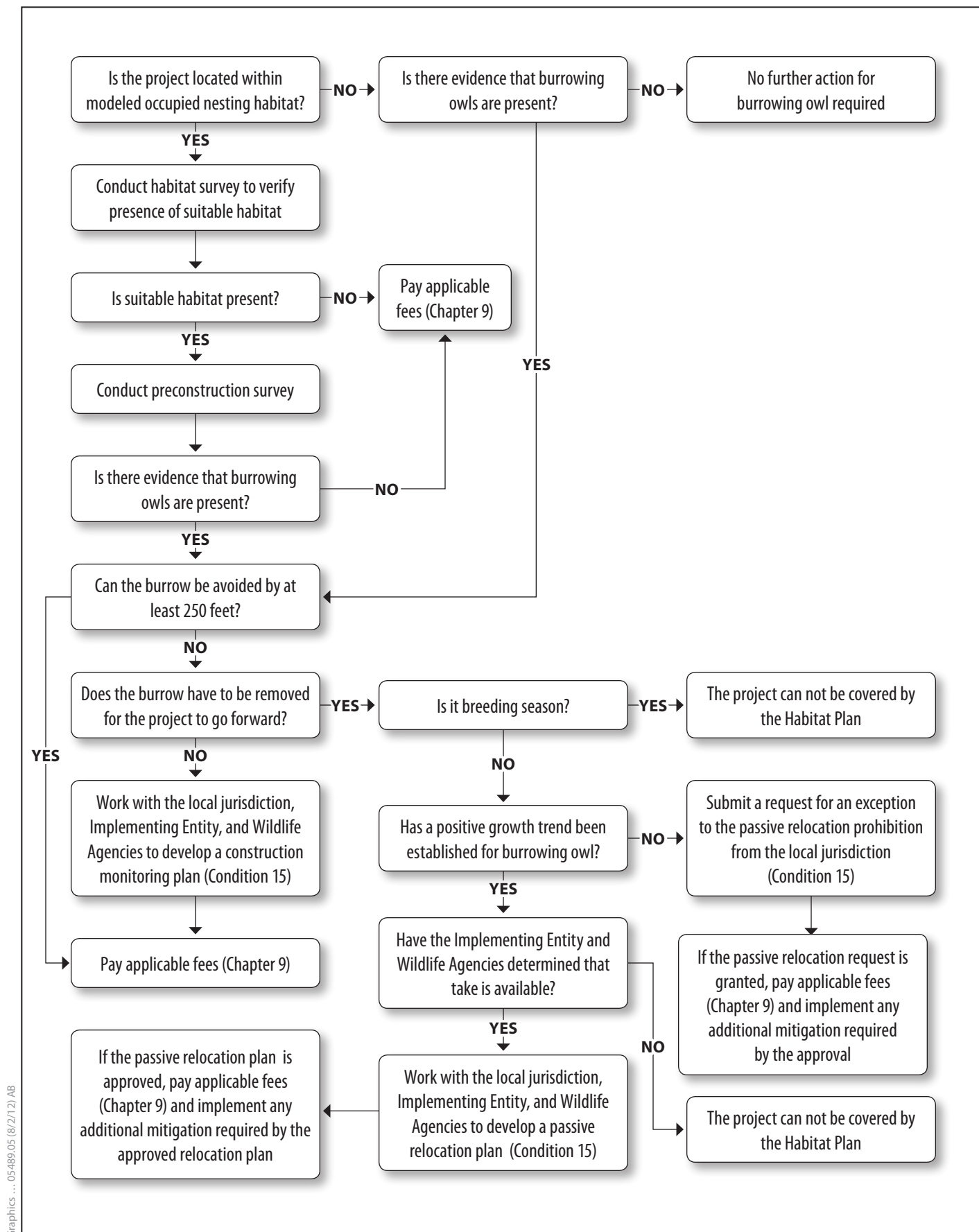
35 ft | Riparian Setback |  
150 ft standard |

150 ft |

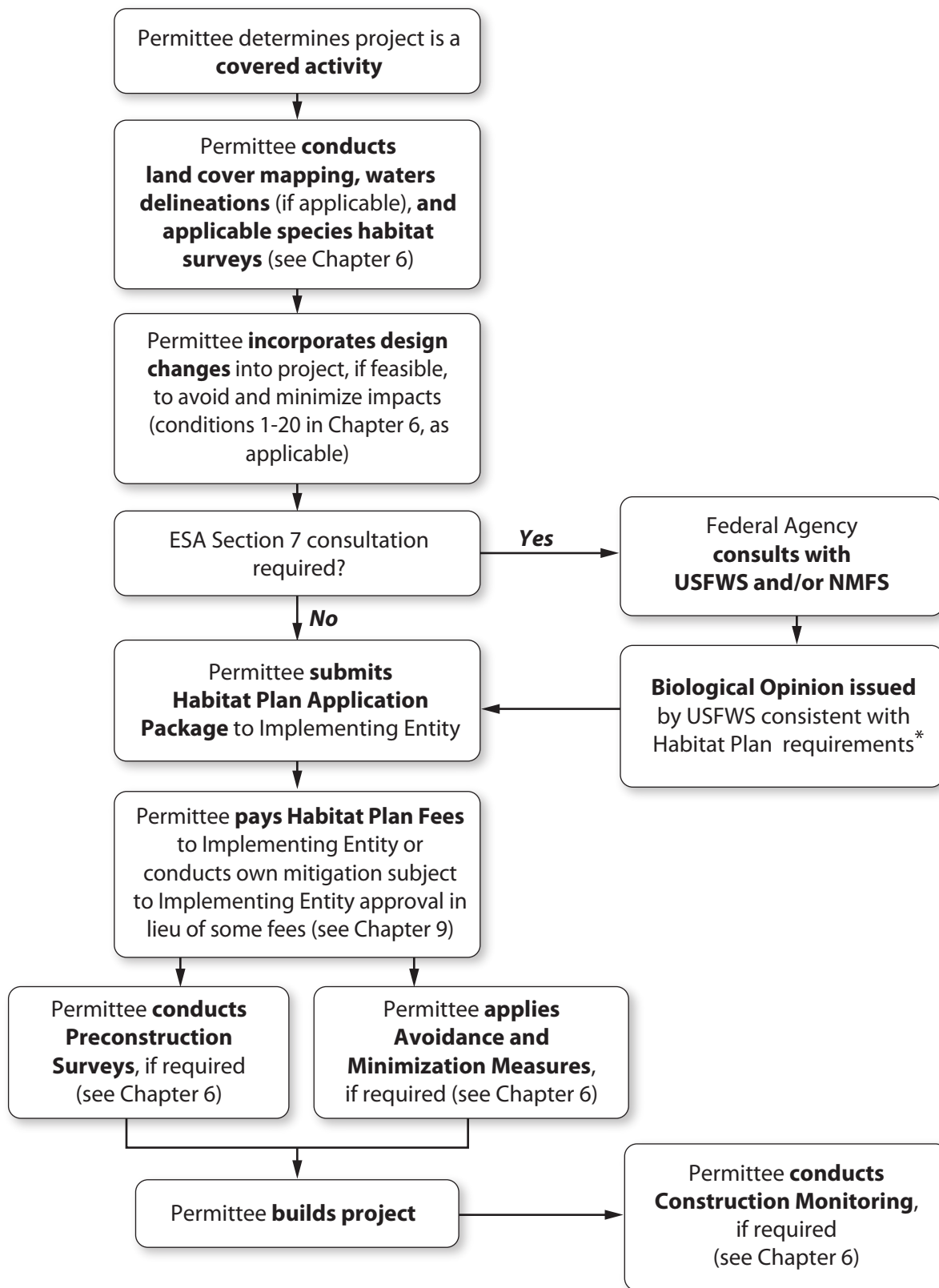


Not to Scale

**Figure 6-3d**  
**Stream Setback Condition – Riparian Vegetation Examples**  
**Category 1 Stream Outside Urban Service Area**

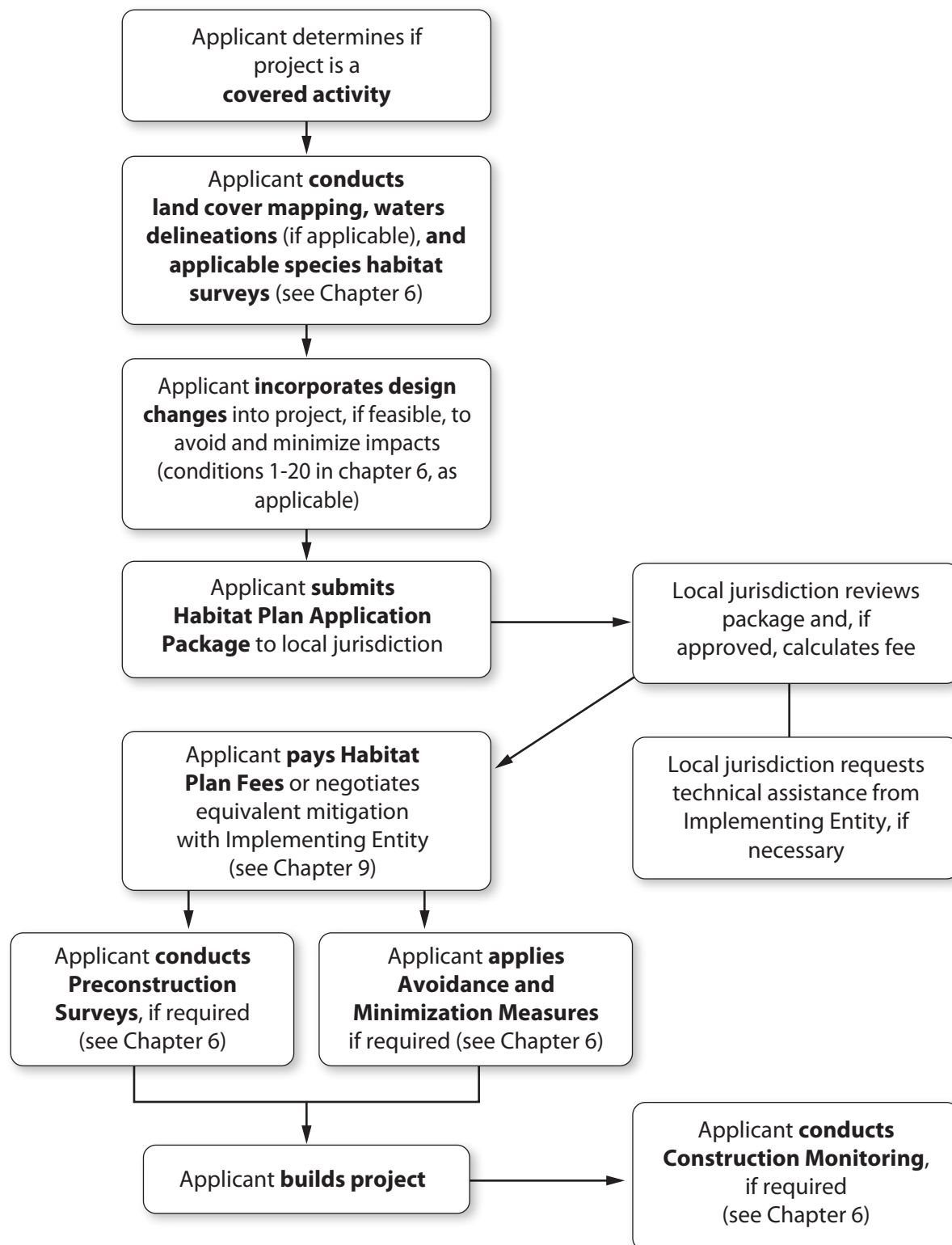


**Figure 6-4**  
**Western Burrowing Owl Survey and**  
**Monitoring Requirements Flow Chart**

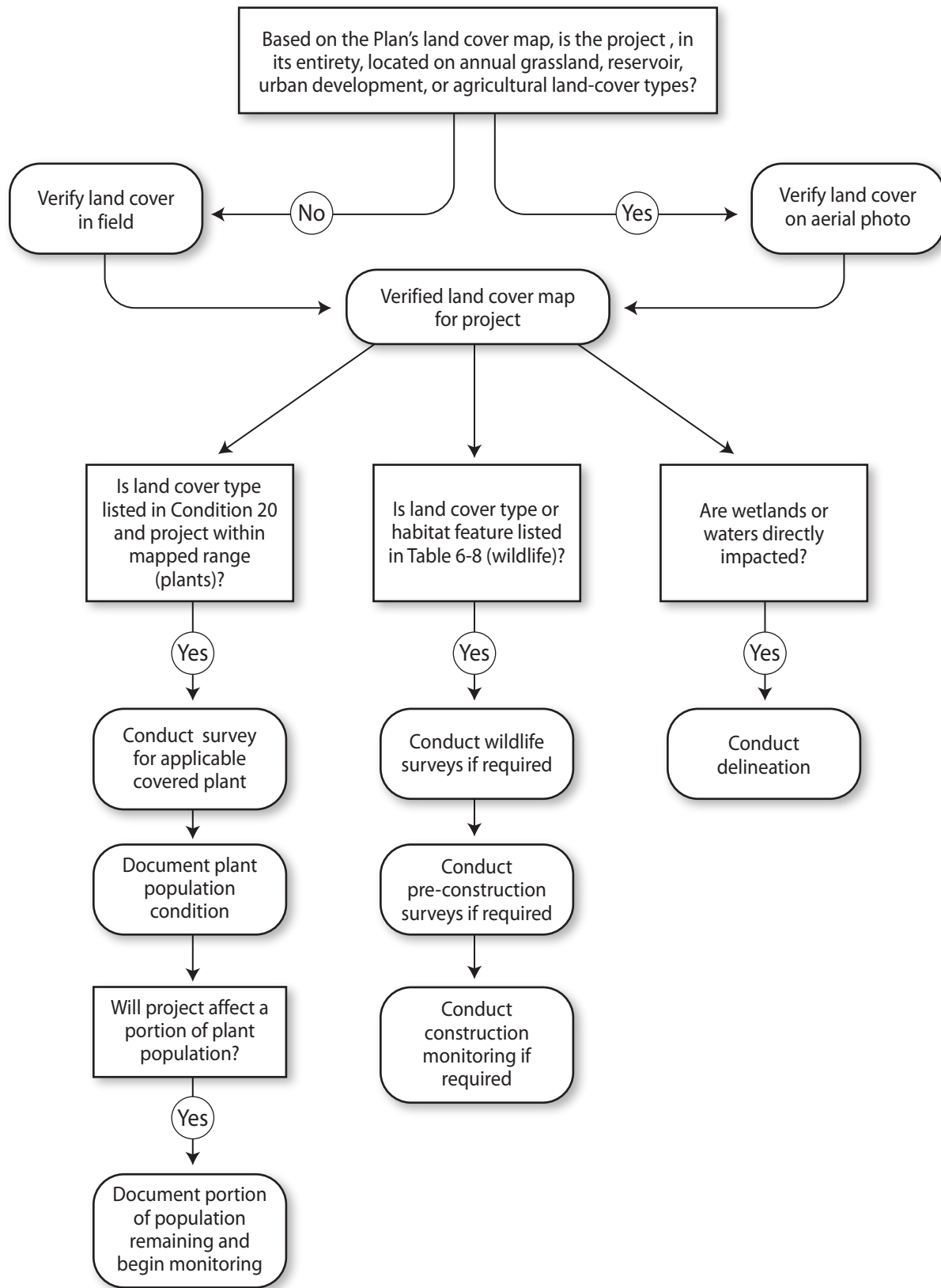


\* Other permits may require different mitigation than required by the Habitat Plan.

**Figure 6-5**  
**Process for Project Compliance with Habitat Plan**  
**for Public Projects (by Permittees)**

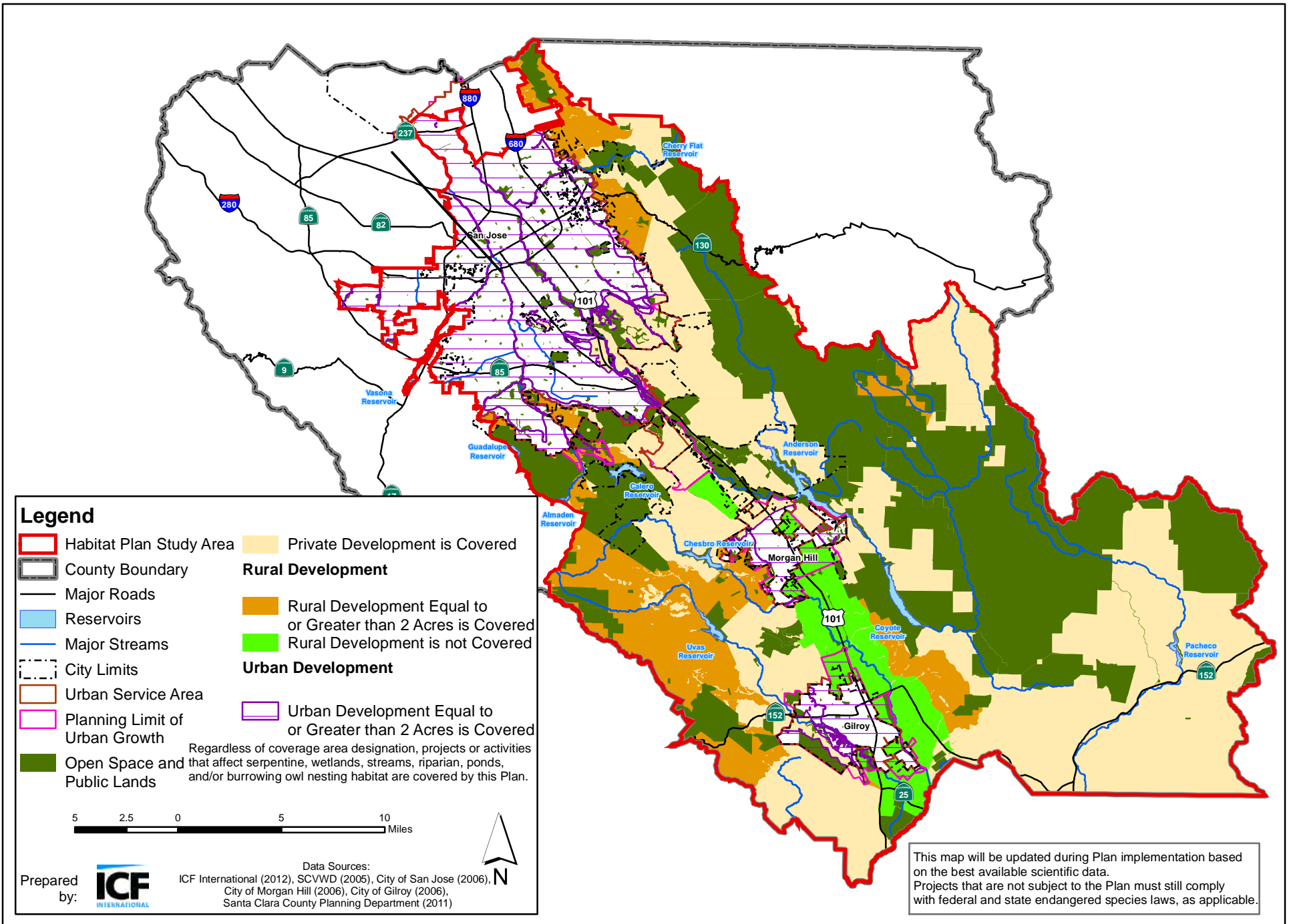


**Figure 6-6**  
**Process for Project Approval under Habitat Plan**  
**for Private Projects Covered by Plan**



Note: If "no" action is not specified, then no action is required.





**Figure 6-8**  
**Private Development Areas Subject to the Plan**



# Chapter 7

## Monitoring and Adaptive Management Program

### 7.1 Introduction

This chapter describes the monitoring and adaptive management program for the Plan. The purposes of this program are to ensure compliance with the Plan; to assess the status of covered and other native species, natural communities, and ecosystem processes within the Reserve System<sup>1</sup> and in certain habitat types outside of the Reserve System; and to evaluate the effects of management actions such that the conservation strategy described in Chapter 5, including the biological goals and objectives (**Tables 5-1a–d**)<sup>2</sup> of the Plan are achieved. Adaptive management and monitoring will be integrated into one cohesive program where monitoring will inform and change management actions to continually improve outcomes for covered and other native species and natural communities. An overview of the program, monitoring and management actions, and data and reporting requirements are found below. Monitoring issues and tools relevant to the three levels of the conservation strategy (landscape, natural community, and species) are described in detail in **Appendix J**.

#### 7.1.1 Regulatory Context

By regulation, an HCP must incorporate monitoring of conservation measures and the response of covered species to these measures (50 CFR 17.22[b][1][iii] and 50 CFR 222.22[b][5][iii]). An adaptive management strategy is a recommended component of Plans with data gaps that would substantively affect how the species is managed and monitored in the future (65 FR 35251). The USFWS and NMFS Five-Point Policy (65 FR 35241–35257) describes adaptive management as an integrated method for addressing uncertainty in natural resource management and states that management must be linked to measurable

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<sup>1</sup> In general conservation actions and monitoring take place within the Reserve System (i.e., lands acquired, managed, and monitored by the Implementing Entity to benefit covered species under this Plan). Monitoring for burrowing owl and tricolored blackbirds will extend beyond the Reserve System boundaries as described below. Monitoring outside of the Reserve System will still occur within the Plan's study area.

<sup>2</sup> The biological goals and objectives conform to the guidance provided by the Five Point Policy as much as feasible, given the scope of the conservation strategy and the fact that the Reserve System has not yet been acquired. In some cases, details on the indicator, location, timeframe, etc. are provided in the narrative text of the conservation strategy. In other cases these details will be developed during early implementation where on-the-ground information can better inform specific management actions for specific parcels. These details will be integrated into the reserve management plans.

biological goals and monitoring. To that end, **Tables 5-1a–d** integrate biological goals and objectives, conservation actions, and monitoring actions to ensure that the program evaluates the conservation measures and assesses the implementation of the biological goals and objectives.

An NCCP must include both a monitoring program and an adaptive management program (California Fish and Game Code Section 2820[7] and [8]). An NCCP also must integrate adaptive management strategies that are periodically reviewed and modified on the basis of the results of monitoring efforts and other sources of new information (California Fish and Game Code Section 2820[a][2]).

The monitoring and adaptive management program described in this chapter is intended to fulfill HCP and NCCP requirements to monitor covered species, natural communities, and species response to management activities. This program will continually incorporate recommendations for monitoring and adaptive management based on the most recent guidelines provided by the USGS Biological Resources Division, CDFG, and USFWS for regional HCPs and NCCPs (Atkinson et al. 2004).

## 7.1.2 Adaptive Management

Adaptive Management is a decision-making process promoting flexible management such that actions can be adjusted as uncertainties become better understood or as conditions change (**Figure 7-2**). Monitoring the outcomes of management is the foundation of an adaptive approach, and thoughtful monitoring can both advance scientific understanding and modify management actions iteratively (Williams et al. 2007).

Adaptive management is necessary because of the degree of uncertainty and natural variability associated with ecosystems and their responses to management. Based on the best scientific information currently available, it is expected that the Plan's conservation actions will effectively implement the conservation strategy described in Chapter 5. However, there are varying degrees of uncertainty associated with the management techniques and conditions within and outside the study area. In addition, the status of covered species and natural communities may change in unexpected ways during Plan implementation. It is possible that additional and different management measures not identified in the Plan will be identified in the future and proven to be more effective in implementing the conservation strategy described in Chapter 5 than those currently implemented. Results of effectiveness monitoring may also indicate that some management measures are less effective than anticipated. To address these uncertainties, an adaptive approach will be used to inform management; the monitoring program will be designed to support this adaptive approach.

The cornerstone of the monitoring and adaptive management program is an experimental approach in which monitoring will yield scientifically valid results that inform management decisions (**Figure 7-3**). Information collected through

monitoring and other experiments will be used to manage reserve lands and protect covered and other native species habitat and natural communities. The adaptive management process will be administered by the Implementing Entity. The Implementing Entity will also coordinate and share the results of monitoring and targeted studies, as appropriate, with other regional restoration and management programs and among the Local Partners and the Wildlife Agencies. A well-coordinated and scalable monitoring program will enable the Implementing Entity and others to measure and evaluate change in resources and threats within individual reserves, across the entire study area, and throughout the ecoregion. Such coordination requires standardization of protocols, sampling design, and training of personnel, as well as integrative data analysis.

Another important component of the adaptive management process is outside review by scientists. Science advisors (see Section 7.2.3 *Program Implementation* subheading *Program Infrastructure*) will evaluate the effectiveness of existing or proposed management actions. The Implementing Entity will incorporate recommendations provided by these reviews, where appropriate, into Plan implementation. It is also intended that the adaptive management program will provide the basis for budget and funding decisions throughout the term of the Plan and in accordance with active adaptive management principles (see **Figure 7-4**).

Integrating adaptive management and monitoring is critical to the successful implementation of the conservation strategy. Monitoring is the foundation of an adaptive approach, and adaptive management actions are developed, in part, from the results of monitoring. In this Plan, the two components are integrated into a single program.

The monitoring and adaptive management program will inform reserve managers and other decision makers of the status of covered and other native species, natural communities, and essential ecological processes such that management actions can be revised when necessary to meet the biological goals of the Plan. The effectiveness of conservation efforts will be evaluated following the model outlined in **Figure 7-4**. This figure illustrates how indicators and success criteria will be developed and how monitoring will be used to ensure the effectiveness of the Plan. The use of conceptual ecological models will also guide monitoring and adaptive management (see **Figure 7-5**). Conceptual models will help frame questions for monitoring, and results will help guide future management and monitoring efforts while simultaneously updating the models (see **Figures 7-6** and **7-7**). Using monitoring to provide information for adaptive management actions will require a framework for measuring responses (**Figure 7-3**). In its simplest form, monitoring that happens immediately after management actions occur will inform future efforts. However, as **Figure 7-3** illustrates, management actions must be developed in concert with monitoring objectives such that increased certainty regarding the significance of the results can be obtained. Pilot projects will be carried out (see Section 7.2.1 *Types of Monitoring* subheading *Targeted Studies*, below), whereby management actions will be treated as experiments, and monitoring will be used to evaluate each action. This will allow management to proceed without complete knowledge of the needs of

the species or ecological processes. All of these components are described more fully in the following sections.

In summary, adaptive management is the land manager's response to new information. Adaptive management actions will likely take place at the following junctures:

- a) In response to the results of targeted studies including pilot projects,
- b) In response to downward trends in the status of covered species or key natural-community variables,
- c) When new information from the literature or other relevant research indicates that a feasible and superior alternative method for achieving the biological goals and objectives exists,
- d) When monitoring indicates that the expected or desired result of a management action did not take place, and
- e) Proactively, when threats are identified through the ongoing development of conceptual models (see **Appendix J**, Section J.2.2 *Natural Community Monitoring Tools* and **Figures 7-6 through 7-9**) or through other monitoring efforts in the study area. An example of an adaptive management action resulting from a pilot project is the decision to use deer exclusion fencing rather than willow planting in target stream reaches to achieve stream restoration based on the empirical results of the study.

Most adaptive management measures will occur when conservation actions do not produce the desired outcome or when species /natural-community trends decrease. In these cases, new actions would be implemented to try and improve the outcome for species and communities. Such actions include but are not limited to the following:

- Alter the timing, location, intensity or type of grazing;
- Reduce, increase or otherwise change the pattern of prescribed burning;
- Change the flow regime released from reservoirs into target streams (e.g., timing, frequency, magnitude of flow levels or events);
- Re-evaluate and, if necessary, alter avoidance and minimization measures;
- Modify age, timing, location, or type of seedling transplantation for natural-community restoration;
- Prioritize or de-emphasize one aspect of noxious weed control such as targeted pesticide use;
- Increase, decrease or desist species-specific conservation actions such as translocation of individuals based on experimental results.

Any of the conservation actions proposed in **Tables 5-1a–d** can be modified in response to new information following the principles of adaptive management.

### 7.1.3 Program Objectives

The overarching objective of the monitoring and adaptive management program is to ensure that the conservation strategy described in Chapter 5 and the biological goals and objectives (**Tables 5-1a–d**) are being achieved. This chapter presents a foundation for accomplishing this task. The reserve unit management plans, which will include monitoring and adaptive management components, will be submitted to the Wildlife Agencies for review and approval within 5 years of the acquisition of the first parcel of each reserve unit. Additional objectives of the monitoring and adaptive management program are listed below.

- Provide an organizational framework and decision-making process for evaluating monitoring, targeted studies, and other data to adjust management actions.
- Document the baseline condition of biological resources in the Reserve System and other key habitat outside of the Reserve System using existing data, modeling, and the results of ongoing field surveys.
- Develop conceptual models for natural communities and covered species, if applicable, that can be used as the basis for collecting information, verifying hypotheses, and designing and changing management practices (see **Appendix J**, Section J.2.2 *Natural Community Monitoring Tools* and **Figures 7-6 through 7-9**).
- Incorporate hypothesis testing and experimental management, including targeted studies to address key uncertainties and to improve management and monitoring efforts.
- Develop and implement scientifically valid monitoring protocols at multiple levels to ensure that data collected will inform management and integrate with other monitoring efforts.
- Ensure that monitoring data are collected, analyzed, stored, and organized so the data are accessible to the Implementing Entity, the Permittees, regulatory agencies, scientists and, as appropriate, the public.

### 7.1.4 Program Scope

Designing a biological monitoring and adaptive management program that is logistically feasible and scientifically sound is a complicated task that will take many years. This chapter provides a framework, guidelines, and specific recommendations that will help the Implementing Entity develop a detailed monitoring component for their reserve unit management plans. Before each reserve unit management plan monitoring component is developed, basic monitoring will be initiated within the Reserve System. Upon permit approval, the Implementing Entity will compile information from ongoing monitoring efforts conducted by the Permittees throughout the study area.

Monitoring priorities will be guided by the species groupings (described in detail below in Section 7.3.3 *Species-level Actions*). Species have been categorized

into three groups on the basis of listing status and portion of range in the study area. Group 1 includes most of the covered species currently listed as endangered or threatened and covered species for which the study area constitutes a critical portion of the species' range.

Conceptual models will be developed for Group 1 species, and baseline surveys will be initiated for newly acquired parcels. If restoration actions are proposed before the reserve unit management plan is in place, a design plan, including experimental design, monitoring actions and adaptive management will be developed, specific to that action. **Table 7-1** provides a summary of monitoring tasks throughout the Plan permit and beyond. Detailed information of monitoring tasks by program phase is found in Section 7.2.2 *Program Phases*.

It is beyond the scope of this Plan to develop a comprehensive monitoring program at this time. Rather, the goal of this chapter is to provide sufficient guidance to ensure that the monitoring program designed during implementation will meet regulatory standards. Because the location and condition of the Reserve System as well as all target areas for monitoring outside the Reserve System are not known at this time, it would be difficult or impossible to develop detailed monitoring requirements including protocols, thresholds, triggers, and other key variables. Furthermore, some of the components of this monitoring program will be new and will therefore require extensive field testing (see Section 7.2.1 *Types of Monitoring* subheading *Targeted Studies*, below) before they can be implemented on a large scale.

This approach of providing a framework, guidelines, and specific recommendations in the Plan is consistent with the monitoring and adaptive management plans for recent, approved regional HCPs and NCCPs including the Western Riverside County Multi-Species Conservation Plan (an HCP/NCCP), Coachella Valley HCP/NCCP, and East Contra Costa County HCP/NCCP. In earlier plans (e.g., the San Diego County Multi-Species Conservation Plan) that promulgated extensive details of the monitoring protocols and standards, it was found early in implementation that many of the protocols were infeasible or did not produce the right data to evaluate Plan success (B. Johnson pers. comm.).

The scope of the monitoring and adaptive management program is limited by the assurances provided by the Wildlife Agencies to the Permittees and described in Chapter 10. These assurances include the commitment by the Wildlife Agencies that if unforeseen circumstances arise (as defined in Chapter 10), the Permittees will not be required to provide additional land, water, or financial compensation beyond the obligations of the HCP/NCCP.

Despite the assurances provided by the Wildlife Agencies, the monitoring program is designed to be flexible. Because the Plan seeks to balance the requirements of management with the need to learn more about the ecological system through monitoring, the amount of funding allocated to monitoring can vary during the permit term. Funding can be shifted within the Plan at the discretion of the Implementing Entity to respond to the changing needs of the monitoring and adaptive management program. The scope of the monitoring and adaptive management program is further defined below.



## Geography

The geographic scope of the monitoring and adaptive management program will be determined by the lands acquired and/or managed for the Reserve System and the streams managed for the conservation benefit of covered species as described in Chapter 5. Because lands for the Reserve System will be assembled over the course of the permit, the exact configuration of the Reserve System is unknown. However, the general locations of acquisition priorities have been defined (**Figure 5-8**). As the Reserve System grows, the monitoring program will also grow. Monitoring of streams and select covered species<sup>3</sup> will occur within and outside the geographic border of the Reserve System. The regional and global context of species and natural communities will be considered when designing and implementing monitoring and adaptive management.

## Levels

Because the conservation strategy functions at multiple levels, the monitoring and adaptive management program must collect information at these multiple levels. The program described in this chapter details the framework for a three-tiered approach that consists of landscape-, natural community-, and species-level monitoring.

Landscape-level monitoring is designed to detect large-scale changes, such as changes in ecosystem processes, shifts in natural community distribution, and the integrity of landscape linkages. Community-level monitoring is designed to detect changes in the composition and function of natural communities, populations of key predator or prey populations, invasive species, and other important habitat factors for covered species. Species-level monitoring measures the effects of management actions on covered species and tracks the abundance, distribution, and other variables of covered species in the Reserve System and the study area. Additional detail on monitoring over these three levels is provided in **Appendix J Monitoring Issues and Tools**.

## Coordination with Other Programs

Monitoring already occurs throughout the study area to varying degrees on public and private lands. Long-term monitoring and scientific experiments are conducted at several sites along Coyote Ridge for Bay checkerspot butterfly and many serpentine plants. The Plan's monitoring program will borrow from these existing programs where appropriate. During the inventory phase, the Implementing Entity will consult with the proponents of these monitoring programs to learn the latest protocols and determine what aspects of their monitoring overlap with the Plan's requirements. There may also be opportunities to conduct joint monitoring efforts to meet the needs of both

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<sup>3</sup> Burrowing owl and tricolored blackbird. See species-specific monitoring discussion later in this chapter.

projects. Monitoring programs relevant to the Plan are referenced throughout this chapter, as appropriate.

The Implementing Entity will also coordinate and share monitoring and other experimental results with other regional restoration and management programs. A well-coordinated and scalable monitoring program design will enable the Implementing Entity and others to measure and evaluate change in resources and threats in individual reserves, across the entire Plan area, and within the ecoregion. Such coordination requires standardization of protocols, sampling design, and training of personnel, as well as integrative data analyses. Some of the programs and organizations with which the Implementing Entity will coordinate are listed below.

- Pacific Gas and Electric Company Bay Area Operations and Maintenance HCP (in progress).
- San Francisco Public Utilities Commission Alameda Watershed HCP (in progress).
- Proposed Three Creeks HCP (in progress).
- Upland Habitat Goals Project (Bay Area-wide).
- East Alameda County Conservation Strategy.
- Stream and biological monitoring conducted by SCVWD.
- Management and monitoring carried out by the Santa Clara County Parks.
- Bird monitoring conducted by the San Francisco Bay Bird Observatory in Santa Clara County.
- Other species monitoring conducted by local organizations such as the Burrowing Owl Consortium, California Native Plant Society, and local Audubon chapters.
- Post-fire recovery monitoring conducted at Henry W. Coe State Park (beginning in 2008).
- Management and monitoring programs conducted by adjacent land management agencies such as the Midpeninsula Regional Open Space District, Peninsula Open Space Trust, East Bay Regional Park District, Don Edwards San Francisco Bay National Wildlife Refuge, California State Parks in Santa Cruz County, and others.
- Long-term monitoring along Coyote Ridge for Bay checkerspot butterfly populations and several covered plant species.
- Future recovery planning efforts by CDFG and USFWS.

In addition, the proposed Three Creeks HCP monitoring and adaptive management program is being developed and will coordinate with the Habitat Plan regarding monitoring tasks for covered species common to the two plans. SCVWD will be responsible for the monitoring identified within the Three Creeks HCP and will coordinate its efforts with the Habitat Plan. The Implementing Entity may contract with SCVWD to undertake additional

monitoring related to the obligations of the Habitat Plan. Agreements for monitoring will be sought between SCVWD and the Implementing Entity once the Implementing Entity is established and the permits for both plans are issued.

## 7.1.5 Take Authorization during Monitoring

Some monitoring activities may require handling or disturbing state or federally listed species; such activities constitute take. The monitoring method is optimal when both the quality of information and the impact on the species is assessed. The monitoring program will consider the impact on the species, particularly in cases of very low population numbers. Take of covered species during monitoring activities is authorized providing that all of the following conditions are met.

- The take occurs in association with activities described in the conservation strategy, monitoring chapter, or reserve unit management plan approved by the Wildlife Agencies.
- The take occurs in the permit area, during the permit term, for activities conducted by the Permittees, the Implementing Entity, or any person acting under the direct guidance or authority of these entities.
- The person(s) undertaking such activities is qualified to do so and can carry out their duties in conformance with the protocols and procedures specified in the monitoring chapter and the reserve unit management plan (see Section 6.8.5 *Item 5: Results of Applicable Species Surveys and Monitoring* subheading *Qualified Biologists*).
- The activity is consistent with the Plan's monitoring and adaptive management program.

In order to meet federal and state requirements, the amount and extent of take must be reported in accordance with the permits. The occurrence of all special status species within the Reserve System will be reported to the CNDDDB.

Simple surveys, such as habitat assessments, that would not result in take will likely be conducted by the biologists within the Implementing Entity. However, more complex biological field work, (e.g., kit-fox surveys, burrowing owl exclusions) may result in take and therefore must be carried out by a "qualified" biologist as defined in Section 6.8.5 *Item 5: Results of Applicable Species Surveys and Monitoring*.

## 7.2 Overview

### 7.2.1 Types of Monitoring

Recent guidance for regional conservation planning defines monitoring as the "systematic and usually repetitive collection of information typically used to

track the status of a variable or system” (Atkinson et al. 2004). Because this Plan monitors resources at three levels, many different variables are tracked. In addition to the levels of scale (i.e., landscape, community, and species), three main types of monitoring are specified: compliance monitoring, effectiveness monitoring, and targeted studies. A description of each of these types is provided below.

## Compliance Monitoring

Compliance monitoring tracks the status of Plan implementation and documents that all requirements of the Plan are being met. Compliance monitoring verifies that the permittees are carrying out the terms of the HCP/NCCP, permits, and Implementation Agreement. It is also known as implementation monitoring. The Implementing Entity will track and ensure compliance monitoring internally and provide results to the Wildlife Agencies who will ensure that the Permittees remain in compliance with the permits, IA, and Plan. As defined by this Plan, compliance monitoring will comprise the components listed below.

- Tracking impacts on land cover types (**Tables 4-2 and 4-3**) and covered species modeled habitat (**Table 4-4**) to ensure impact limits are not exceeded and to ensure compliance with the Stay-Ahead requirements. This includes the time commitments for restoration/creation not tied to impacts (see **Table 5-14**) and time commitments for other conservation actions (see Chapter 5).
- Tracking the loss of occurrences of covered plants to ensure that impacts do not exceed the level authorized under permits (see **Table 4-6** for impact limits) and ensuring that equivalent or healthier plant occurrences are protected in the Reserve System (see Chapter 5).
- Tracking impacts to critical habitat for the bay checkerspot butterfly, California tiger salamander, and California red-legged frog (**Table 4-9**).
- Tracking habitat enhancement, restoration, and creation actions (**Tables 5-13, 5-16, and 5-21**).
- Tracking implementation of acquisition requirements (**Tables 5-11, 5-13, 5-16, 5-19, and 5-21**).
- Tracking implementation of management agreements for western burrowing owl nesting habitat (number of acres under management).
- Tracking implementation of other conservation actions on and off the Reserve System.
- Tracking implementation of avoidance and minimization requirements (see Chapter 6).
- Tracking and reporting of management and monitoring activities (Atkinson et al. 2004).

## Effectiveness Monitoring

Effectiveness monitoring assesses the biological success of the Plan—specifically, it evaluates the implementation and success of the conservation strategy described in Chapter 5. Effectiveness monitoring includes monitoring the effects of management activities. An important component of this monitoring is determining patterns within the Reserve System relative to the baseline status and trends of biological resources. The Implementing Entity will design, conduct and report on the results of effectiveness monitoring. Wildlife Agencies, Science advisors and an Independent Conservation Assessment Team will have an opportunity to provide input on and evaluate the proposed effectiveness monitoring and its results (see Section 7.2.3 *Program Implementation*). Both status and trends monitoring and effects monitoring are described below.

### Status and Trends

Indicators of the status and trends of biological resources are monitored to provide baseline data regarding the increase or decrease of these resources in the study area. Baseline data provides a temporal snapshot of the status of natural resources at the first year of monitoring and is a metric against which to compare future data. Status and trends monitoring will include quantitative data on covered species (population size, distribution), land cover, and modeled habitat as well as nonnative invasive species and other known threats. Additionally, historical data on population size or distribution can be relevant to understanding the current condition. For species or natural communities that go through natural fluctuations or variations, historical trends are more important than single year surveys. Qualitative assessments of vegetative structure and/or habitat quality will also be a component of status and trends monitoring. Examples of status and trends monitoring include quantitative data on covered species numbers, acres of land cover types in the study area, occurrences of invasive plant populations, and incidences of natural disturbance (e.g., fire, flood).

### Effects of Management

Understanding the effects of management actions is a critical component of the monitoring and adaptive management program. The purpose of effects monitoring is to ascertain the success of management in achieving desired outcomes, to provide information and mechanisms for altering management if necessary, and to evaluate whether the conservation strategy described in Chapter 5 was successful.

The preliminary or initial component of effects monitoring will include the development and assessment of success criteria for management actions such as stream restoration, pond creation, and butterfly relocation. Where they exist, the biological goals and objectives will determine the form that success criteria take. Once success criteria are developed, effects monitoring will include monitoring these criteria as well as assessing the effects of management on covered species.

Finally, the effects of threat-abatement activities (e.g., density of nonnative invasive plants) will be evaluated (Atkinson et al. 2004).

To determine the effects of management, management actions will be conducted using an experimental approach when feasible (**Figure 7-3**).

## Targeted Studies

Targeted studies fulfill three major objectives:

1. Identify the best methodologies for monitoring;
2. Provide information about the efficacy of management techniques; and
3. Resolve critical uncertainties allowing for improved management of systems and species.

For the purposes of this Plan, targeted studies that provide information regarding monitoring protocols are called *methods testing*. Targeted studies that provide information regarding the effects of management actions are called *pilot projects*. Targeted studies that address critical uncertainties are called *directed studies*. Methods testing and pilot projects will be conducted by the Implementing Entity or its contractors. Directed Studies could be carried out or funded by the Implementing Entity. However, the Implementing Entity may also utilize graduate students, University researchers, or other scientists whose project goals inform critical uncertainties and further the biological goals and objectives of the Plan. In addition, directed studies may be funded by outside sources if the work carried out on Reserve Lands furthers the Implementing Entity's understanding of covered species and natural communities.

## Method Testing

Method testing is designed to evaluate alternative monitoring protocols and sampling designs and to select the best technique for obtaining information. For example, if the objective is to quantify wildlife use of a corridor crossing, methods testing might compare the use of tracking plates, bait stations, and trail cameras. The results of method testing would then be used to develop a long-term monitoring protocol.

## Pilot Projects

Pilot projects will be used during implementation to ascertain, on a small scale, which management actions may ultimately yield the desired conservation gains prior to initiating a long-term project. Pilot projects are also a cost-effective way to test management actions. Pilot projects can and should be used during the early phases of Plan implementation to field test different management actions (see **Figure 7-3** for a continuum of experimental management).

## Directed Studies

The term *critical uncertainties* refers to key questions that shape how the ecological system is actively managed. Because natural systems are extremely complex and dynamic, varying degrees of uncertainty are associated with conserving and managing these systems. Typically, management proceeds absent a full understanding of the components that affect a natural community or a species. The outcome of these management actions are carefully monitored and refined in acknowledgement of the high level of uncertainty. Directed studies are used to reduce the levels of uncertainty related to achieving biological goals and objectives. These uncertainties are generally related to the factors listed below:

- The ecological requirements of covered species, and
- The likely response of covered species and natural communities to implementation of conservation actions within the Reserve System.

All of the conservation actions identified as “STUDIES” in **Tables 5-2a–b** are considered directed studies. The Implementing Entity may propose additional directed studies not identified as conservation actions. Directed studies will be carried out to gain insights into key questions identified in the conservation strategy and during Plan implementation. All proposed directed studies will be prioritized during implementation and will be carried out based on their priority ranking. Directed studies identified in **Table 5-2b** will be prioritized and funded as part of conservation strategy implementation.

Results of directed studies conducted under the Plan will inform management and ensure attainment of the biological goals and objectives. It is expected that some or all of the directed studies specifically outlined in the conservation strategy will be conducted by the Implementing Entity or consulting scientists. Additional long-term directed studies, identified during Plan implementation, will be conducted by or in partnership with outside scientists from academic institutions, consulting firms, and nonprofit organizations. It is anticipated that funding provided by the Implementing Entity for directed studies could be matched or supplemented by other entities to increase the level of investigation and to achieve results that integrate with broader issues in the scientific community. In addition to the directed studies undertaken to answer critical uncertainties, it is expected that the Implementing Entity will develop partnerships with academic institutions (e.g., undergraduate student projects, Masters theses, Ph.D. dissertations) to help address broader scientific interests within the Reserve System that will nonetheless inform and improve management and monitoring techniques. Funding for this and other programs is described in more detail in Chapter 9 *Costs and Funding*.

## 7.2.2 Program Phases

The essential elements of the monitoring and adaptive management program have been organized into three main phases: inventory, targeted studies, and long-term monitoring and adaptive management.

Key tasks in each phase are described in below. In general, activities in the inventory phase will occur during the first 5 years of Plan implementation and thereafter as parcels are added to the Reserve System. For individual sites, the inventory phase will begin immediately after land acquisition. Most targeted studies will be concentrated in the first 5 years of Plan implementation, but they will likely continue throughout implementation as management uncertainties are identified and resolved. Activities in the long-term monitoring phase will begin on each site after the inventory phase is complete. Because the Reserve System is being created over several decades there will likely be extensive overlap between activities in each phase during the first 10–20 years of Plan implementation (**Figure 7-1**). Also, see **Table 7-1** for a summary of monitoring tasks throughout the permit term.

### Inventory Phase

The initial inventory phase of monitoring occurs following permit approval and continues as new parcels are acquired and added to the Reserve System or new conservation actions are initiated outside the Reserve System, primarily on streams. Baseline information collected during the inventory phase will lay the foundation of the overarching monitoring and adaptive management program. Inventories will need to occur over multiple seasons to ensure that all species present are identified. If a parcel is acquired in a drought, it may take several years for certain plants to appear, for example. Under normal conditions, the initial inventory will take place within 3 years of acquisitions for each site. The Implementing Entity will inventory and assess landscapes, natural communities, and species, as appropriate, within the Reserve System. This information will build largely on the data collected during pre-acquisition assessments and will be supplemented by post-acquisition monitoring.

In addition to the acquisition of baseline information, the inventory phase will focus on the identification of key relationships between species, habitats, and processes; the prioritization of project implementation; the refinement of species groups; and the selection of biotic and abiotic indicators for evaluating ecosystem condition. Information collected during the inventory phase will build on species information (**Appendix D**) as well as other data sources (e.g., historical ecology reports).

### Document Baseline Conditions

Baseline conditions within the Reserve System need to be documented to enable management planning and to serve as a comparison point for all future



monitoring. Accordingly, resources of interest that occur on a site need to be documented, mapped and, if required to measure compliance with biological goals and objectives, censused. Also, baseline surveys and post-construction monitoring will take place in areas where activities may impact a covered plant occurrence. Documenting baseline conditions will consist of the following tasks.

- Update GIS land cover layer with aerial photographs, satellite imagery, and other relevant data sources including serpentine soils maps at the outset of implementation.
- Inventory and document resources and improve mapping as the Reserve System is assembled. The results of the assessments for land acquisition (i.e., pre-acquisition assessment; see Chapters 5 and 8) will be the first source of baseline data. Data-collection methodologies and nomenclature will be standardized to facilitate sharing of information.
- Conduct baseline surveys for plants in areas where covered activities may impact plant occurrences (Condition 20).
- Research and document historical data and trends, as appropriate.
- Use baseline data to validate and refine species habitat models as lands are surveyed and acquired (species models will be updated periodically, but no less frequent than every 5 years, consistent with new survey data collected from the Implementing Entity, from land cover mapping provided by project applicants, and from other relevant sources).
- Conduct post-acquisition biological inventories. Additional surveys will be needed to supplement data gathered in pre-acquisition assessments.
- Conduct post-construction surveys for covered plants in areas where covered activities may have impacted occurrences of covered plants (Condition 20).
- Use aerial photos and ground surveys, as needed, to assess quality and location of local and regional landscape linkages between unprotected natural areas and adjacent protected lands.
- Collect additional baseline data needed to refine conceptual models (see **Appendix J**, Section J.2.2 *Natural Community Monitoring Tools* and **Figures 7-6 through 7-9**).

## Initiate Management Planning

Management planning will consist of the following tasks.

- Prioritize implementation of conservation actions to best achieve biological objectives.
- Develop reserve unit management plans (described in Chapter 5, Section 5.2.5 *Land Management*).
- Confirm species monitoring groups and refine the monitoring schedule.
- Identify biotic and abiotic indicators (see section on indicators for description) for testing during the targeted studies phase.

- Select monitoring protocols and identify sampling design for status and trends and effects monitoring. Test experimental designs during the targeted studies phase, as necessary.
- Develop criteria for measuring success of enhancement, restoration, and creation efforts (see example criteria in **Table 7-2**).
- Develop criteria to assess effectiveness of conditions on covered activities (described in Chapter 6 *Conditions on Covered Activities and Application Process*).

Upon implementation of the Plan, the Implementing Entity will document baseline conditions along with survey methods and monitoring schedules based on the guidelines for monitoring described below. Some species have boom/bust population dynamics that are highly dependent upon weather (e.g., Bay checkerspot butterfly and some of the covered plants). Survey protocols and the success criteria developed will account for this. These protocols and schedules will provide the overarching framework that will be implemented in each management unit. The Implementing Entity will draw from relevant and established protocols (e.g., Wildlife Agency and CNPS survey protocols) and will adapt them throughout the permit term to incorporate the best available scientific data.

A monitoring component will be developed for each reserve unit management plan that identifies protocols, indicators, monitoring schedule, and success criteria. This component will be revised to include information from methods testing, pilot projects and directed studies as results become available. Before the reserve unit management plan for a given reserve is complete, monitoring on lands in the Reserve System will consist of baseline inventories, pilot projects to test monitoring methods, and directed studies.

## Targeted Studies Phase

The targeted studies phase of monitoring also follows permit approval and will continue as long as critical uncertainties persist (**Figure 7-1**). However, most targeted studies will take place within the first 5–10 years of Plan implementation such that results can inform long-term management. The Implementing Entity will develop conceptual models for key natural communities (see **Figure 7-8**) and covered species (see **Figure 7-9**) that identify critical management uncertainties; design and initiate pilot projects to test management and monitoring methods; develop and initiate experiments that resolve critical uncertainties; and begin pretreatment monitoring of sites considered for enhancement, restoration, or creation.

## Develop Ecological Models

Management-oriented conceptual ecological models will be a cornerstone of the monitoring program and will be created during the initial years of

implementation. These models will inform the monitoring program by identifying relationships between ecosystem components and by identifying management assumptions. As the monitoring program collects additional data, these “living” models will serve as a framework for management decisions and will function as reference points for the Implementing Entity’s understanding of the relationship between management and natural communities and/or covered species within the Reserve System. In addition, species conceptual models that identify threats, management and monitoring for species will be developed. A full description of conceptual ecological models and species conceptual models is found in **Appendix J**, Sections J.2.2 *Natural Community Monitoring Tools* and J.3.1 *Species-Specific Monitoring Tools* respectively.

## Test and Refine Monitoring Protocols

In the targeted studies phase, the Implementing Entity will conduct methods testing (described above) to develop, test, and refine monitoring protocols. Monitoring protocols will be developed for landscapes, natural communities, species groups, and individual covered species. The purpose of this testing is to identify the best and most cost-effective monitoring methodologies to derive the desired information. For example, one of the biological objectives of the conservation strategy is to increase the permeability of certain barriers, such as highways, in the study areas. Monitoring will need to assess wildlife movement in target areas. The targeted studies phase will test methods (e.g., camera traps, track plates, use of bait) to determine the desired protocols for long-term monitoring. Monitoring protocols will be conducted in a repeatable manner and will provide both quantitative and qualitative data to inform management design within the Reserve System.

In some cases there is little distinction between pilot projects and long-term monitoring. During the targeted studies phase, different management techniques will be implemented and evaluated experimentally. In some cases, restoration, enhancement, and monitoring methods are not known or have not been successfully reproduced on a large scale by land managers or the scientific community. Before restoration or enhancement through management can occur successfully, these methodologies need to be tested on a smaller scale. These pilot projects, designed to test the effectiveness of restoration and enhancement, are necessarily long-term (i.e., 5–15 year) endeavors; they will inform long-term management but will also be included as part of the long-term management program. Results from these early studies will guide future efforts in the Reserve System. This feedback will increase the efficiency with which reserve lands can be managed and the overall success rate of management activities. For example, a study published in 2004 evaluated the effectiveness of methodologies for restoring riparian vegetation (Opperman and Merelender 2004). Similar pilot projects will be developed in the targeted studies phase when multiple techniques are intended to achieve a desired outcome and are appropriate for monitoring habitat function within the Reserve System and overall study area.

Testing the use of indicators for natural communities or covered species; refining monitoring protocols; establishing control plots for long-term management; and

reviewing the literature for guidance on sampling, experimental design, and management will all be a part of the targeted studies phase of implementation.

## Develop Experiments to Resolve Critical Uncertainties

A final element of the targeted studies phase of implementation is the development of experiments that resolve critical uncertainties. In some cases, critical uncertainties will be identified as conceptual models are developed (see **Appendix J**, Section J.2.2, *Natural Community Monitoring Tools*, **Appendix J**, Section J.3.1, *Species-Specific Monitoring Tools*, and **Figures 7-6 through 7-9**). In other cases, critical uncertainties have been identified and described as part of the biological objectives of the Plan (see especially the Directed Studies section of **Table 5-2b**). For example, in order to enhance the chaparral land cover types, the critical uncertainty of factors contributing to the health and regeneration of native chaparral species must be resolved. The targeted studies phase of implementation will entail initiation of projects that resolve the critical uncertainties identified in the Directed Studies section of **Table 5-2b** as well as any other critical uncertainties identified as the conceptual models are developed.

In addition, the Implementing Entity will work with other individuals and organizations (e.g., local universities) to facilitate targeted studies on the Reserve System and streams that will improve management.

## Long-Term Monitoring and Adaptive Management Phase

Both the inventory phase and the targeted studies phase will be followed by long-term monitoring to determine the status and trends of landscapes, natural communities, and species and the effectiveness of the management of the Reserve System in achieving the biological goals of the Plan (**Figure 7-1**). Monitoring that does not depend on the results of targeted studies will occur as soon as the reserve unit management plans have been reviewed and approved by the Wildlife Agencies and baseline studies are complete (inventory phase) or sooner, if appropriate. Long-term monitoring will use the framework developed during the inventory phases to carry out effectiveness monitoring and to implement adaptive management.

The long-term monitoring phase includes the following tasks.

- Update GIS land cover layer with aerial photographs, satellite imagery, and other relevant data sources including serpentine soils at least every 5 years. Assess status and trends at the landscape and natural community levels.
- Monitor species (covered species or indicator species) response to enhancement, restoration, and habitat creation.

- Monitor restoration sites for success; remediate sites if initial success criteria are not being met. The reserve unit management plan will identify triggers for remediation, if necessary.
- Monitor covered species using methodologies developed in targeted studies phase. Assess status and trends of covered species by monitoring covered species populations, groups, or guilds of species or indicators over time.
- Assess status and trends of covered plants that may have been partially or temporarily impacted by covered activities to ensure that plant protection in the Reserve System adequately offsets impacts.
- When enhancement and restoration projects are complete and have met final success criteria, scale back monitoring effort (i.e., frequency, extent) but continue to adaptively manage these sites<sup>4</sup>.
- Update **Figure 2-5 Private Development Areas Subject to the Plan** based on best available science throughout implementation to ensure projects in specific portions of the permit area are required to go through the Plan are appropriately identified. Revisions to the map will be tracked in the annual report.

In addition to long-term monitoring, this phase will include steps to adaptively manage the Reserve System to implement the conservation strategy described in Chapter 5. Adaptive management tasks are listed below.

- **Evaluate efficacy of monitoring protocols.** During this phase, the results of pilot projects will be evaluated and incorporated into long-term monitoring efforts.
- **Incorporate best available scientific information into management.** Regular reviews of literature as well as interaction with the Science advisors and the Wildlife Agencies will ensure that new understanding of the species or monitoring approaches is incorporated into the monitoring and adaptive management program.
- **Evaluate and refine conceptual models.** Conceptual models will be developed for each species and for natural communities (see **Appendix J, Section J.2.2 Natural Community Monitoring Tools**, **Appendix J, Section J.3.1 Species-Specific Monitoring Tools**, and **Figures 7-6 through 7-9**). In addition, the existing species habitat models developed for this Plan will be refined. As more information becomes available and as assumptions evolve, the models will reflect changes and continue to provide guidance for future monitoring efforts.
- **Review any unexpected or unfavorable results and test hypotheses to achieve desired outcome.** Unexpected results or results suggesting that the conservation actions will not likely meet the conservation strategy commitments described in Chapter 5 of the Plan will be probed to understand

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<sup>4</sup> Frequencies of monitoring will be dependent on the natural community or species and will be determined during the development of the reserve unit management plans. In some cases, monitoring will be conducted on an annual basis, in other cases, monitoring may only be necessary every 3–5 years.

the cause or source of the result. Hypotheses about management outcomes will be tested.

- **Adjust management actions and monitor.**
- **Adjust success criteria and conservation actions, if necessary.** The success criteria and conservation actions developed for the Plan will be adjusted if they have been determined to be inappropriate indicators of success (too high or too low, based on biological information), if more cost-efficient but equally successful conservation actions are developed and agreed upon by the Wildlife Agencies, or if they are inadequately conserving species or communities. The magnitude of the change to the success criteria will be based on best available scientific information. New or different conservation actions may be implemented through time, as long as they fulfill the conservation strategy commitments described in Chapter 5 of this Plan. Conservation actions are catalogued in **Tables 5-1a–d and 5-2a–b** and are described in more detail in Section 7.3, *Monitoring and Management Actions*, below. Example success criteria are described in **Table 7-2**. Operational success criteria will be developed during the Targeted Studies phase of implementation. Changes to success criteria and conservation actions will be discussed with and not implemented until approved by the Wildlife Agencies. For significant changes, a permit amendment may be necessary.

## 7.2.3 Program Implementation

### Program Infrastructure

As described above, adaptive management is a critical element of the Plan because it addresses many of the uncertainties of the Plan and provides for continual adjustment and improvement toward meeting Plan goals and objectives. Key to the success of the adaptive management program is a clear and effective structure for making decisions on the basis of new data from Plan monitoring and information from other sources. The Implementing Entity will be advised by five groups that play an important role in adaptive management:

- Wildlife Agencies,
- Other land management agencies (or a Technical Advisory Committee),
- Science advisors,
- Independent Conservation Assessment Team, and the
- Public.

As a preliminary planning step to coordination, the Implementing Entity will inventory monitoring projects and programs in the study area, their goals, timelines, design, protocols, etc. This will help coordinate information and will be an important first step in developing the monitoring component of the reserve

unit management plans. The Implementing Entity's responsibilities for executing the adaptive management program are listed below.

- Designing and implementing a scientifically robust effectiveness monitoring program (described above).
- Gathering monitoring and research data, including relevant information developed by others, and maintaining databases.
- Disseminating monitoring and research data generated by the Habitat Plan, including monitoring reports, conference presentations, and published papers to others.
- Assessing the effectiveness of conservation measures relative to the conservation strategy described in Chapter 5.
- Identifying the need to modify existing or to adopt additional conservation measures and defining what to change and how to change it.
- Identifying the need to modify the monitoring program and defining what to change and how to change it.
- Identifying the need for and implementing experimental pilot projects.
- Identifying and prioritizing targeted studies and conducting studies that inform critical uncertainties.
- Developing and updating the monitoring and adaptive management elements of reserve unit management plans.
- Incorporating monitoring, directed studies, and other adaptive management-related activities into reserve unit management plans.
- Creating and maintaining a network of science advisors (see below) to provide advice to the Implementing Entity, as needed, on adaptive management and monitoring issues including important data gaps, monitoring and management methods, and data interpretation.
- Periodically (at least every 5 years) convening the Independent Conservation Assessment Team (Section 7.2.3 *Program Implementation*) to conduct a program-wide review of Habitat Plan implementation, including monitoring and adaptive management, and providing recommendations to improve Habitat Plan implementation.
- In Year 20 of implementation, work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System.

The Implementing Entity will solicit input regarding adaptive management from the Wildlife Agencies, science advisors, Independent Conservation Assessment Team, other independent experts, and the public. In addition, the Implementing Entity may convene technical committees to seek focused advice on key adaptive management topics. The responsibility for which course of action to take in adaptive management rests with the Implementing Entity and its senior staff or senior contract biologists. However, the Wildlife Agencies will assist the Implementing Entity with the adaptive management program. Major shifts in the adaptive management program need to be reviewed and approved by the Wildlife

Agencies. Major shifts include, but are not limited to, proposed actions that may be inconsistent with the Plan or detrimental to a covered species, introducing new and untested management techniques, discontinuing and replacing ineffective management techniques that are recommended in the conservation strategy, or applying management techniques on a much larger or smaller scale than envisioned in the Plan. Decisions made in the adaptive management program will be based primarily on which course of action is most likely to meet the conservation strategy described in Chapter 5.

## Wildlife Agencies

A primary role of the Wildlife Agencies is to provide feedback to the Implementing Entity regarding changes to Plan implementation based on the results of targeted studies and monitoring and on the recommendations of the science advisors, the Independent Conservation Assessment Team, academic scientist partners, and others. Where possible, Wildlife Agency staff will provide expertise in the biology and conservation of covered species and natural communities, management tools, monitoring program, and all other Plan implementation.

The Implementing Entity and the Wildlife Agencies will strive at all times to work in good faith with each other to reach mutual agreement on key implementation tasks such as adaptive management, monitoring, and conservation actions. The primary forum in which these discussions will occur is the Technical Advisory Committee described in Chapter 8, Section 8.2.4 *Technical Advisory Committee*. Additional meetings with the Wildlife Agencies may be needed to discuss and resolve key issues related to adaptive management and monitoring. If disagreements arise that cannot be resolved easily, the Implementing Entity will follow the “meet and confer” dispute resolution process outlined in Section 6.6.1 of the Implementing Agreement, and if necessary, the “elevation of dispute” process outlined in Section 6.6.3 of the Implementing Agreement (**Appendix B**).

## Land Management Agencies

As discussed above, the Implementing Entity will share information and resources in implementing management across reserve boundaries and on a regional scale with other land management agencies in the study (e.g., County Parks, State Parks, and the Open Space Authority). Input from other land management agencies in the study area is an important component of successful adaptive management. Land management agencies that manage land on behalf of the Implementing Entity (i.e., as part of the Reserve System) will form a Technical Advisory Committee to coordinate management and ensure consistency across the Reserve System.



## Science Advisors

The Implementing Entity will consult science advisors who will provide regular advice on Plan implementation. The role of the science advisors is to provide the Implementing Entity with science-based expert opinion and recommendations, focused “white papers,” peer review, and feedback regarding key scientific aspects of Plan implementation such as reserve assembly, reserve management, and monitoring protocols. Science advisors will be contacted by the Implementing Entity and its partners, including the Wildlife Agencies, as needed. They may also be convened as a group when needed to address specific topics. Science advisors will be scientists and resource managers with expertise in one or more of the following areas:

- Covered species,
- Landscape ecology,
- Natural communities in the Reserve System,
- Ecological processes,
- Resource management,
- Biological monitoring,
- Statistical analysis and experimental design.
- Conceptual models,
- Species-specific surveys, and
- Species protocols.

Science advisors will be selected by the Implementing Entity with input from the Wildlife Agencies. The Implementing Entity may also request that the science advisors review the following types of information prepared by or for the Implementing Entity.

- Proposals for directed studies to address important management questions.
- Management and monitoring reports and recommendations to the Implementing Entity provided by others.
- Monitoring priorities, sampling design, survey protocols, data analysis, and data storage.
- Proposals for experimental pilot projects to test natural community enhancement/creation/restoration or management techniques.
- Proposed changes in reserve design and management, natural community enhancement/restoration/creation techniques, alternative conservation measures, and monitoring methods, based on interpretation of monitoring or research results and consistent with the protocols for, and limitations on, the Adaptive Management Program.

## Independent Conservation Assessment Team

The Independent Conservation Assessment Team will be composed of highly qualified scientists and resource managers who are independent of the Habitat Plan and the science advisors. Selecting members who are independent of the Plan is important to ensure an unbiased assessment of Plan implementation. The role of the Independent Conservation Assessment Team is to provide periodic review of overall Habitat Plan implementation, including the following specific areas:

- Assembly of the Reserve System and the progress of habitat restoration efforts;
- The appropriateness of the monitoring and management methods being used to achieve Plan goals, including indicators and success criteria;
- The appropriateness of the interpretation of monitoring data; and
- Changes that may be needed in conservation, management, or monitoring to better achieve Plan goals.

The Independent Conservation Assessment Team will provide policy-level recommendations to the Implementing Entity. The Independent Conservation Assessment Team will be selected and convened by the Implementing Entity at least every 5 years as part of the 5-year major Plan review. The Wildlife Agencies will be consulted regarding prospective members. A 5-year interval will allow progress to be made toward Plan compliance and biological goals and objectives, as well as the collection of monitoring data sufficient to support a thorough and meaningful progress review. It is expected that the composition of the Board will change each period, although some consistency in membership is preferred. It is also expected that the scope of review of the Independent Conservation Assessment Team will vary each time they are convened. For example, the first time they meet their review will likely focus on the initial phases of implementation and early monitoring results and protocols. Later reviews will focus on more extensive monitoring data and results.

## The Public

Members of the public will have opportunities to learn about Plan status and provide input to the Implementing Entity on adaptive management during periodic (at least annual) public hearings and regular meetings of the public advisory committee, which will be open to the public. Members of the public may offer important contributions to a successful adaptive management program, such as providing data on covered species, critical reviews of monitoring data, and suggestions for improved land management. Members of the public may also participate in data collection through a volunteer program supervised by the Implementing Entity or its designee.

## 7.2.4 Guidelines for Monitoring

Because the biological outcome of many management actions is uncertain, the monitoring and adaptive management program is based on scientific principles that guide continual refinement of conservation efforts in order to implement the conservation strategy described in Chapter 5. The adaptive management program will develop alternative management strategies and test the effectiveness of those strategies in the Reserve System. To that end, there is a continuum of management actions that incorporate scientific principles of adaptive management to varying degrees (**Figure 7-1**). The most basic monitoring involves simply assessing effects once a management action has occurred without any replication, controls, or comparison of management treatments. At the other end of the spectrum are directed studies that test a hypothesis in a manner that can be validated through statistical inference. Even simple experimental methods will yield important results to help guide and improve management. The scientific principles listed below will guide monitoring and adaptive management.

- Adaptive management actions will incorporate scientific principles of replication, control, and pre- and post-treatment monitoring when necessary to accurately measure the Plan's implementation of the conservation strategy. Targeted studies will refine monitoring protocols and resolve key management uncertainties.
- Adaptive management and monitoring actions will be linked to hypotheses about species' ecological relationships and responses to management actions. Monitoring will be designed in such a way as to test these hypotheses.
- When feasible, adaptive management or directed studies will include an experimental design with appropriate significance levels (alpha level) as well as sufficient statistical power to detect effects (beta level).

Adaptive management, and the design of targeted studies, will be driven by hypotheses about key factors for the landscape, natural community, and/or species for which the management is applied. For example, if the goal of management is to increase populations of small mammals to serve as a prey base for certain covered species (e.g., western burrowing owl, San Joaquin kit fox), land managers must develop hypotheses about what controls small mammal abundance and distribution. Adaptive management actions and monitoring will be directed toward confirming or disproving those hypotheses. Directed studies will be conducted on a small scale using an experimental design that will yield statistically valid results to address critical uncertainties. Ultimately, if small mammal availability limits the abundance of covered species, increasing the prey base may increase the survival and fitness of covered species. If the prey base increases and the covered species do not respond, then other factors apparently limit their abundance.

In addition to the scientific guidelines described above, the following steps will be included in the experimental design.

1. **Define the question.** Monitoring strategies will be designed to address specific hypotheses. Conceptual, statistical, or spatially explicit models will define those hypotheses. Conceptual models are described in **Appendix J**, Sections J.2.2 *Natural Community Monitoring Tools* and J.3.1 *Species-Specific Monitoring Tools*.
2. **Determine what to measure.** Establish the attributes or variables that the monitoring will measure to answer the question defined above. This step includes the development of measurable success criteria for evaluating creation, restoration and enhancement actions.
3. **Develop monitoring protocols.** Questions to be answered by the monitoring program will be at the species, natural community, and landscape level. Monitoring protocols will vary with level and with the target of the monitoring. Monitoring protocols will be developed in accordance with the guidelines provided below in Section 7.2.4 *Guidelines for Monitoring* subheading *Protocols*.
4. **Use indicator species, if appropriate.** In some cases, groups of species or indicator species will streamline monitoring. Indicators are selected because they are easy to survey and provide usable information on the species or system in question. Guidelines for selecting and using indicators are described in detail below.
5. **Consider sampling design.** Sampling design needs to be a consideration prior to initiating the experiment. The experimental management approach of the HCP/NCCP requires that questions of site selection, statistical power, and significance be incorporated, as much as possible, into the monitoring and adaptive management program. Sampling design is described in detail below.

In addition, **Appendix J** *Monitoring Issues and Tools* provides guidance on monitoring challenges relevant to landscape, natural community and species for the study area.

## Indicators

Indicators can be used in many ways: to predict species richness (MacNally and Fleishman 2004), to estimate biodiversity (Kati et al. 2004; Chase et al. 2000), to assess levels of disturbance, or to provide targeted information on a system or species (Caro and O'Doherty 1999; Carignan and Villard 2004). Landres et al. (1988) define an indicator species as

an organism whose characteristics are used as an index of attributes too difficult, inconvenient, or expensive to measure of other species or environmental conditions of interest.

In this Plan indicators will be used, when appropriate, to provide information on covered species and other components that are difficult to survey, and to provide information on natural community or ecosystem function. In some cases indicators will be used to determine the availability of habitat for a species. For

example, the presence of a California ground squirrel colony would be an indicator for available upland habitat for California tiger salamander if there is also breeding habitat within dispersal distance. In that circumstance, the expansion of ground squirrel colonies would then represent an increase in available habitat for California tiger salamanders. Measuring the increase in ground squirrel colony size is much easier than measuring the increase in use by California tiger salamanders. Additionally, when there are complex interactions among biotic and abiotic factors, modeling species responses or using abiotic factors as an indicator may not be appropriate. Monitoring aspects of the target species may be a more reliable and often easier “indicator” than abiotic factors (like temperature, substrate or turbidity). For the purposes of this Plan, indicators are abiotic and biotic variables that are selected to facilitate monitoring of systems or species that are otherwise difficult to examine.

In cases where an indicator is used to monitor an ecosystem or natural community (health indicator species), the conceptual models will be used to help identify an appropriate indicator species or variable. Draft performance indicators for natural community enhancement, restoration, and creation measures are presented in **Table 7-2**. Indicators, in general, are easy to monitor and demonstrate changes or trends that are quantifiable. Indicators need not be species, but may be ecological variables or structure-based characteristics such as diameter and age class of trees, interpatch distances between habitat, or key structural features of certain habitat types (e.g., snags or downed logs in forests, woody debris in rivers) (Noss 1999; Lindenmayer et al. 2000). Effective indicators (or variables) have some or all of the following characteristics (Carignan and Villard 2002; Atkinson et al. 2004).

- They are relevant to program goals and objectives and can be used to assess the program performance at the appropriate spatial and temporal levels.
- They are sensitive to changes in the ecosystem, providing early warning of response to environmental or management impacts.
- They indicate the cause of change, not just the existence of change.
- They provide a continuum of responses to a range of stressors such that the indicator will not quickly reach a minimum or maximum threshold.
- They have known statistical properties, with baseline data, references, or benchmarks available.
- They are technically feasible, easily understood, and cost effective to measure by all personnel involved in the monitoring.

The indicators or variables will be coordinated with existing programs and data sets that are complementary to, and consistent with, the conservation strategy of this Plan. Prior to adopting any indicator, field verification and fine tuning in the system of interest is necessary (Atkinson et al. 2004). Once monitoring variables have been selected, the following descriptions will be made (Atkinson et al. 2004 as adapted from Gibbs et al. 1999 and National Research Council 2000).

- “What” will be monitored.

- “Why” the monitoring is useful (i.e., the specific question the variable is designed to address).
- “When” will the variable be monitored and at what frequency.
- The conceptual ecological model underlying the selection of the monitoring variable.
- The geographical area where it will be monitored (e.g., transect locations, stream miles).
- The specific variable that will be measured and the protocol that will be used.
- The range of values the monitoring can produce and what these would mean.
- The expected response (as in response to management or outside pressures) and the magnitude of change expected.
- The time frame and spatial scale over which change is expected to be demonstrated.

The monitoring component of each reserve unit management plan will clearly present the rationale for using indicators. Indicators must be applicable and appropriate measures of the biological goals and objectives. For example, the monitoring component will specify why monitoring the presence of egg masses for covered amphibians is an appropriate indicator of population-based goals and objectives. In this example, the reserve unit management plans will justify that counting individual adults, larvae, and/or metamorphs is not the only or preferred way of monitoring for population status. The recommendation of the science advisors will also help guide the selection of indicators and the Implementing Entity will work with Wildlife Agencies to develop appropriate indicators. Finally, it is important to consider how the results will be interpreted and how they can be used to create change, if necessary.

## Protocols

When available, scientifically accepted monitoring protocols that are compatible with measuring the success of the conservation strategy of this Plan will be adopted to facilitate data comparison with other studies. Monitoring protocols will be appropriate to the task, accurate, and as cost-effective as possible. Monitoring protocols will be standardized across the entire Reserve System and will be incorporated into all reserve unit management plans. To be successful, the monitoring protocols must be applied consistently by different observers and across monitoring cycles. Ongoing training by Implementing Entity staff or their contractors will be necessary to ensure this consistency. For example, the National Park Service’s Inventory and Monitoring Program guidelines for monitoring protocols (Oakley et al. 2003) or the Bureau of Land Management’s guidelines (Elzinga et al. 1998), in addition to other sources, can be used as references for developing monitoring protocols.

Monitoring protocols will vary by covered species. For species that are difficult to detect in the study area (e.g., San Joaquin kit fox), monitoring may be limited

to determining whether the species persists from sample period to sample period, what features define its habitat, and what threats it faces. Surveys for species that are more readily detectable (e.g., California tiger salamander, California red-legged frog) may detect whether the species' range is increasing or decreasing. For species that are sufficiently detectable to obtain estimations of population size or probability of detection (e.g., western burrowing owl, many covered plants), monitoring a randomly selected subset of the population in order to make statistical inference to the whole population can be achieved through adherence to the principles listed below.

- Develop and state the assumptions in the hypotheses and models *before* collecting monitoring data or conducting manipulations such as experiments and adaptive management.
- When designing an experiment or using adaptive management, select the number and location of sampling units so as to apply sufficient scientific rigor for evaluating the hypothesis being advanced.
- Replicate in space and time the number of the sites surveyed for population estimates and/or those receiving a management action. Use controls when appropriate.
- Measure the sensitivity of variables to reflect true changes in the resource being sampled. When appropriate, adjust counts, measures of species richness, and determinations of patch occupancy (i.e., presence/absence) with an estimate of detection probability as described by Lancia et al. (1996), Yoccoz et al. (2001), and Pollock et al. (2002).

## Sampling Design

Sampling design will vary with the goals and phases of monitoring. During the inventory phase, baseline inventories may require a less rigorous sampling design, relying, for example, on visual surveys for detecting presence or absence. "Rapid Assessment" techniques may also be used. As on-the-ground monitoring progresses, site selection and replication merit increased attention based on the goals of the monitoring at that time.

An important goal in sampling and experimental design is to minimize extraneous variance in the measured values of indicators or variables. Selection of variables will be guided by a thorough knowledge of the ecological relationships that drive natural communities. Sampling intensity and probability of detection will be considered to ensure that all covered species are adequately inventoried and monitored. Recent studies have indicated that monitoring programs that fail to address issues of detectability and spatial variation have drastically overestimated population trends over time (Martin et al. 2007). Prior to implementing simple count-based indices for population trends for covered species, researchers must have confidence that detectability will remain constant over time. Methods of data analysis will be established prior to study design, and a statistician or biologist with sufficient statistical expertise will be consulted. Issues to consider (Scheiner and Gurevitch 1993) are listed below.

- Availability of sites on which treatments can be applied.
- Availability of reference sites.
- The site-selection process (is it random? stratified random? non-random?).
- Systematic versus opportunistic sampling.
- Detection probability of the protocol.
- Replication versus pseudo-replication (Hurlbert 1984).
- The clarity of hypotheses.
- Sufficient statistical power ( $1-\beta$ ) or significance level ( $\alpha$ ).

## 7.3 Monitoring and Management Actions

### 7.3.1 Landscape-Level Actions

Landscape-level monitoring will be directed at tracking large areas, landscape-level processes, and regional issues that affect the study area. **Table 5-1a** correlates landscape-level monitoring actions with biological goals and objectives for landscapes. Landscape-specific issues such as linkages, invasive nonnative plants and animals, disturbance, disease, and hydrology are described in **Appendix J *Monitoring Issues and Tools***. The section below summarizes the specific monitoring actions that the Implementing Entity will carry out to track environmental issues at the landscape level and ensure that landscape-level goals and objectives are being met. Compliance monitoring is described above in Section 7.2.1 *Types of Monitoring* and will take place at all levels of monitoring, including the landscape level.

### Assimilate Results of Pre-Acquisition Assessments and Other Surveys

Information on landscape features will be collected through pre-acquisition assessments, including biological surveys, updated land cover mapping, assessments of habitat suitability for covered species, air photo interpretation, and the biological resources present or expected on site, that provide information on the extent, quality, and distribution of land cover types in the Reserve System. These data will be used to refine existing species habitat models and develop natural community conceptual models (see **Appendix J**, Sections J.2.2 *Natural Community Monitoring Tools* and J.3.1 *Species-Specific Monitoring Tools*, and **Figures 7-6 through 7-9**). Additionally, this information will be combined with landscape-level information being collected by others in the region to provide resource managers, including the Implementing Entity, with an understanding of how critical biological resources are generally trending under the influence of Plan implementation as well as under the influence of other human activities and other environmental factors (e.g., fire, drought, disease). Annual information on



precipitation and whether the study area is experiencing a wet or dry water year will also be collected to facilitate trends analysis and potential impacts on baseline and other surveys for covered species and natural communities.

## Refine Land Cover Maps

At the landscape level, the Implementing Entity will monitor, using aerial photos or satellite imagery, the extent and distribution of land cover types within the study area every 5 years. If feasible, this monitoring could occur at a more refined level following significant natural events that affect the reserve system (e.g., flood and wildfire). This effort will begin during the Inventory Phase but will continue throughout all phases of Plan implementation. Land cover mapping will be verified in the field at sites where air-photo interpretation is difficult. Species models, including maps, will be improved as new data become available.

## Assess and Monitor Landscape Linkages

Prioritizing, acquiring, assessing, managing, and monitoring landscape linkages are important tasks at the landscape level (**Table 5-9** and **Figure 5-6**). One of the primary goals of the conservation strategy is to sustain and enhance the effective movement and genetic exchange of native organisms within and between natural communities inside and outside the study area. To monitor landscape linkages the Implementing Entity will use a combination of compliance monitoring (to ensure that land acquisition requirements are met) and effectiveness monitoring (to ensure that species utilize linkages effectively and that management actions to increase permeability or improve connectivity are successful). Effectiveness monitoring will include studies of wildlife and plants.

The inventory phase of monitoring will prioritize acquisition of linkages, develop management protocols to enhance linkages, and develop success criteria for the effectiveness of linkages at sustaining movement and genetic exchange. The targeted studies phase will test methodologies for monitoring linkages. The Implementing Entity will evaluate whether linkages are successful at the small scale (e.g., testing use of culverts by target species using camera traps, track plates, or other techniques) and the large scale (e.g., testing connectivity by monitoring indicator species such as elk or badger or through genetic testing of target species). Studies on plant linkages will focus on plant dispersal dynamics and success (Bullock et al. 2006) and on genetic exchange between populations if and where possible. The objective of the targeted studies phase is to determine the most cost-effective and accurate way of evaluating whether landscape linkages are functioning within the context of the Plan. The long-term monitoring phase will implement methodologies identified in the targeted studies phase.

The Implementing Entity will institute a data-collection program to better understand how wildlife moves within and through the study area, both inside and out of the Reserve System. This data-collection program will be initiated

within the first 2 years of implementation. The data collected through this effort will be available for design and implementation of covered road projects. This program will remove the burden of data collection from each participating agency and ensure that all the data collected during the permit term is collected and collated consistently, is maintained in a central location, and is accessible. The conservation strategy includes funding for a feasibility study to determine the extent and needs for wildlife movement in three focal areas: Tulare Hill to Anderson Reservoir, Pacheco Creek (SR 152), and the Pajaro River (see Chapter 5, Section 5.3.2 *Landscape Conservation and Management*, subsection *Feasibility Study*). This feasibility study will be an important part of the data-collection program for wildlife movement in the study area.

Data collection will consist of two parts: monitoring the presence/absence of target species at designated locations across the study area, and monitoring the presence/absence of target species in specific locations determined by future covered activities. Data collection at consistent locations will entail regular and repeatable monitoring at strategic pinch points (e.g., culverts, bridges) in the study area to determine if existing linkages provide connectivity and if enhancement of these crossings increases wildlife movement. This component of the program could entail establishing monitoring stations at specific points or walking transects. Data-collection techniques could include those listed below.

- Installing motion-activated cameras (video or still).
- Installing and monitoring track plates.
- Visual documentation of tracks, scat, or individuals.
- Radio tracking individuals.

By coordinating with the Local Partners, specific monitoring efforts will be implemented in areas where covered activities (e.g., road widening, urban expansion, creek restoration) are planned to occur in the future. This component of the data-collection program can be used to inform project design and to determine more precisely the cumulative impacts that covered activities will have on habitat connectivity in the study area.

In addition, all structures constructed for wildlife movement (tunnels, culverts, underpasses, fences) will be monitored at regular intervals by the Local Partner facility owner and repairs made promptly to ensure that the structure is in proper condition. For facilities owned by entities not participating in the Habitat Plan (e.g., California Department of Transportation [Caltrans]) and where feasible, the Implementing Entity will secure access and data collection agreements with these entities to allow the Implementing Entity to conduct this monitoring.

## Track Climate Change

As indicated in Chapter 10 *Assurances*, climate change-related remedial measures will be triggered if there is an increase in temperature greater than 3°C for any of the three baseline periods measured as a 10-year running average (see

Chapter 10, Section 10.2.1 *Changed and Unforeseen Circumstances*). The annual report will document changes in temperature in the study area throughout the permit term.

## Track Invasive Species

A primary goal of the Plan is to enhance or restore representative natural landscapes to maintain or increase native biological diversity. To that end the conservation strategy proposes to eradicate or reduce the cover, biomass, and distribution of targeted populations of nonnative invasive plants. Within the Reserve System, the Implementing Entity will map occurrences of invasive nonnative plants as described in **Appendix J**, Section J.1.2 *Landscape Monitoring Tools* subheading *Mapping of Invasive Plants*.

Monitoring protocols for invasive plants will be coordinated with those of other local entities to ensure consistency with these programs and facilitate the sharing of monitoring results. This monitoring information will be used to determine the need for management actions to control the spread of existing invasive plants as well as potential future invasions. The effectiveness of control methods will also be reviewed. This monitoring information will be shared with state and local land management agencies charged with the control of invasive plants, including the Bay Area Early Detection Network ([www.baedn.org](http://www.baedn.org)) and the California Invasive Plant Council ([www.cal-ipc.org](http://www.cal-ipc.org)) as well as with managers of adjacent public lands.

During the inventory phase of monitoring, the Implementing Entity will identify and prioritize problems; map occurrences of invasive plants, if possible; develop an exotic species control program; and develop success criteria for the effectiveness of eradication or reduction efforts. The targeted studies phase will develop protocols for invasive species monitoring and test methodologies for monitoring eradication efforts. The objective of the targeted studies phase is to determine the most cost-effective and accurate way of controlling invasive species. The long-term monitoring phase will entail implementation of methodologies identified in the targeted studies phase.

Occurrences of invasive animals will also be documented in GIS and management actions will be developed to prioritize and address nonnative, disruptive animals. For example, feral pig is an invasive species of special concern. Rooting disturbance by feral pigs allows nonnative invasive plants to establish in grassland and aquatic communities, and fall acorn foraging likely has a detrimental effect on oak regeneration (Sweitzer and Van Vuren 2002). During the inventory phase, areas frequented by feral pigs will be identified for feral pig eradication (through hunting and trapping) and exclusion (using fencing exclosures and cages). During the targeted studies phase, protocols will be developed to monitor the presence/absence of feral pigs over time. Monitoring will track the effectiveness of feral pig eradication and ensure that exclosures from grassland, oak woodland, and aquatic habitat types are effective and maintained. In addition, protocols will assess the extent and types of damage to vegetation and soils caused by pigs, including detection of exotic plant species in

areas of pig rooting. These protocols will then be used as part of long-term monitoring for feral pig eradication and exclusion.

Instances of disease will be monitored and reported, as they are discovered. The Implementing Entity will maintain a watchlist of dangerous diseases for the study area and will periodically monitor animals and plants, as part of species and natural community monitoring, to ensure that any occurrences of diseases are identified.

The Implementing Entity will track, on an annual basis, the status of diseases and nonnative invasive species in order to expeditiously initiate remedial actions described in Chapter 10, Section 10.2.1 *Changed and Unforeseen Circumstances*.

## Track Recreation in the Reserve System

Many areas of the Reserve System will serve the dual purpose of habitat protection and limited recreational use. The impacts of recreational use on biological resources must be monitored and managed adaptively to reduce or eliminate impacts. During the inventory phase, potential impacts on species and communities will be identified, recreational plans developed, and protocols created to evaluate effects of public access and use. During the targeted studies phase, signs of disturbance from recreational use will be documented and assessed annually using established protocols. Long-term monitoring will track trends in recreation impacts to adjust management practices to reduce or eliminate impacts.

## Monitor Disturbance Events

Disturbance events such as fire, flood, and earthquakes will be monitored opportunistically. Should fire or flooding occur in an area that has been previously monitored, the Implementing Entity will ensure that post-disturbance monitoring takes place and that results are incorporated adaptively into management actions. Additional information regarding disturbance tracking is described below, in Section 7.3.2 *Natural Community–Level Actions* subheadings *Chaparral and Northern Coastal Scrub* and *Oak and Conifer Woodland Actions*. The Implementing Entity will monitor the effects of these natural disturbances and implement remedial actions as described in Chapter 10, Section 10.2.1.

### 7.3.2 Natural Community–Level Actions

Natural-community-specific issues such as keystone species, predation, fire, livestock grazing, and altered stream flow are described in **Appendix J** *Monitoring Issues and Tools*. The section below summarizes the specific monitoring actions that the Implementing Entity will carry out to track

environmental issues at the natural-community level and ensure that natural-community-level goals and objectives are being met.

## Grassland Actions

As described in Chapter 5 *Conservation Strategy*, adaptive management in grasslands will be focused on the maintenance and enhancement of native grasses, the benefit of covered species, and the promotion of native biological diversity. Monitoring actions will focus on the effectiveness of management to reduce the presence of nonnative plants, to increase the extent and diversity of native plants, and to promote keystone species (i.e., California ground squirrel) within the natural community for the benefit of native plants and animals, including covered grassland species such as Bay checkerspot butterfly, California tiger salamander, serpentine plants, western burrowing owl, and San Joaquin kit fox. **Table 5-1b** correlates natural community monitoring actions with biological goals and objectives for natural communities.

The monitoring program will evaluate the success of key management techniques such as livestock grazing, prescribed burning, mowing, and seeding to promote native plants and reduce the cover and biomass of nonnative, invasive plant species. Additionally, the program will track the ground squirrel population and evaluate the effectiveness of management and promoting additional burrows and monitoring burrow use. Finally, the monitoring program will track the impacts of nitrogen deposition and other threats on natural community function.

## Assess Condition of Natural Communities

The Implementing Entity will conduct monitoring to assess the status and trends of the grassland community and to evaluate community function. If feasible, information on the historical ecology of grassland will help guide assessments. The tasks listed below will be carried out to document the baseline conditions from which change will be measured.

- Use pre-acquisition assessments and site inventories to document the distribution and vegetation types of grasslands, including patches of serpentine grassland and rock outcrops not captured in existing maps. Methods to quantify and track the conditions of vegetation types will follow those of existing studies such as the vegetation sampling conducted by the CNPS along Coyote Ridge and WRA Environmental Consultants at the Silver Creek Preserve (Evens and San 2004; WRA Environmental Consultants 2006).
- Develop a management-oriented conceptual model for grasslands that includes important factors such as the effects of rainfall, temperature, fire, herbivory (i.e., grazing) and succession to woody communities (e.g., chaparral/scrub or oak woodland), and identify indicators for community function as well as any critical uncertainties that may require additional directed studies (**Figure 7-8**).

- Assess and monitor invasive nonnative plants. This task will entail developing maps and descriptions of the distribution and abundance of target species; their known or potential effects on ecosystem function; native biological diversity; sensitive natural communities; covered species; and the means and risk of the spread of nonnative species to other areas within and outside the reserves. Focus on species that have the greatest potential to threaten grasslands such as yellow and purple star-thistle, barbed goat grass, teasel, and others.
- Assess the historic extent, conditions, and fire return interval of grassland within the study area using aerial photographs and historic records.
- If prescribed burns are feasible and desirable, prepare burn plans that describe pre- and post-burn monitoring to determine effects.
- Assess grassland landscape connectivity between reserves.
- Assess and track the health of serpentine rock outcrops and serpentine seeps if necessary beyond the monitoring for rare plants that occur in these communities (Santa Clara Valley dudleya and Mount Hamilton thistle).
- Examine potential negative impacts of grazing on sensitive communities and substrates such as rock outcrops and seeps.
- Identify and track additional threats (such as nitrogen deposition) and manage adaptively to contain these threats.

## **Monitor Actions to Promote Native Plants and Reduce Invasive Species**

As discussed in Chapter 5 *Conservation Strategy*, the biological goals and objectives for grasslands include implementation of management actions that will promote propagation of native plants, reduce and control invasive nonnative species, and encourage native biodiversity through the maintenance of dynamic mosaics of vegetation types and biological gradients. Specific tasks to further these goals and objectives are listed below.

- Develop success criteria for grassland enhancement and evaluate the success of management actions (i.e., grazing, burning, mowing, and seeding) in reducing nonnative plants and promoting the extent and diversity of native plants.
- Develop guidance for grazing within the study area and grazing plans for specific parcels, as applicable, using an experimental approach to achieve the biological goals and objectives.
- Develop pilot projects that test the effects of different grazing practices (e.g., grazing intensity, duration, season, species) on the maintenance and regeneration of native grasses and forbs. If possible, combine grazing treatments with other management techniques such as prescribed burns and hand seeding to detect interactions between management treatments.

- Evaluate the success of any herbicide applications used to control nonnative plants in target areas.

## Monitor Ground Squirrel Populations and Burrow Use

As discussed in Chapter 5 *Conservation Strategy*, California ground squirrel is considered a keystone species in grassland habitats. Because of its importance in functioning as a prey base for some predatory covered species and providing refugia for some terrestrial covered species, it will be important to monitor populations and/or burrow use and density. At the same time, historical rodent-control programs will need to be continued in localized areas to protect vulnerable infrastructure (e.g., pond berms, levees, road embankments, dam faces). The tasks necessary to carry out the goals and objectives pertaining to fossorial mammals are listed below.

- Monitor ground squirrels and/or populations of other small mammals to determine the abundance of prey and burrows for several covered species (e.g., western burrowing owl, California tiger salamander) and many common species.
- Determine if ground squirrel burrows are being used by target species.

## Chaparral and Northern Coastal Scrub Actions

Adaptive management and monitoring of the chaparral and northern coastal scrub communities are built around the conservation goal of maintenance and enhancement of these communities for the benefit of covered species and the promotion of native diversity. To ensure the long-term persistence of the communities, monitoring actions will focus on the effectiveness of management to promote regeneration and succession by maintaining and establishing natural disturbance patterns to create stands of various ages and promote biological diversity.

Many of the plants in the chaparral and northern coastal scrub communities have evolved to be dependent on a disturbance regime of periodic fire for regeneration and succession (Holland 1986; Hanes 1988; Schoenherr 1992). In chaparral communities, disturbance causes canopy openings that allow for the growth of herbaceous vegetation, which is normally shaded out by a nearly continuous shrub stand. In both chaparral and northern coastal scrub communities, chemicals in smoke and charred wood also stimulate germination in a wide variety of native forbs that lie dormant as seeds in the soil for decades before a fire (see Chapter 3). Periodic disturbance allows for structural diversity by creating a range of age classes and promoting successional diversity within the communities. Also, periodic disturbance prevents the encroachment of both grasslands and conifer woodland and forest into chaparral and scrub.

The monitoring program will evaluate the success of burning or mechanical thinning to maintain canopy gaps and promote regeneration. Monitoring will

also focus on identifying areas where adjacent natural communities are encroaching into chaparral and scrub so that appropriate management actions can be implemented at those sites.

## **Assess Condition of Natural Community**

Regeneration and succession stages within the chaparral and northern coastal shrub communities will be managed through both a prescribed burn program and mechanical thinning. The tasks listed below will be carried out to document the baseline conditions from which change will be measured.

- Use pre-acquisition assessments (updated land cover mapping, assessments of habitat suitability for covered species, air photo interpretation) and other field verification to establish the distribution and abundance of small stands of chaparral and northern coastal scrub (<10 acres) not mapped for the Plan that may be important in increasing connectivity between larger stands.
- Develop a conceptual model for the natural community and identify indicators for community function as well as any critical uncertainties that may require additional directed studies.
- Assess the historic extent, conditions, and fire frequency of chaparral and northern coastal scrub stands within the study area using aerial photographs and historic records of fire in the area. This information will be used to determine whether active management is required to maintain the structural diversity of these stands in their current extent and condition.
- If prescribed burns are feasible and desirable, prepare burn plans that describe pre- and post-burn monitoring to determine effects.
- Identify areas where grassland, oak woodland and Douglas-fir habitats are encroaching on chaparral scrub, paying close attention to patches that are necessary for maintaining landscape connectivity.
- Conduct targeted research identifying key factors affecting regeneration and succession.

## **Evaluate Effects of Periodic Disturbance**

It is necessary to monitor the responses of the chaparral and scrub communities to wildfires, prescribed burning, and mechanical thinning. The tasks necessary to determine the response of these actions on promoting canopy gaps, regeneration, and succession in chaparral and northern coastal scrub are listed below.

- Develop structural diversity success criteria and compare post-treatment conditions to baseline conditions to measure the effectiveness of prescribed burning on natural community regeneration and succession.
- Compare results of mechanical thinning to structural diversity success criteria and baseline conditions, and measure the effectiveness of mechanical thinning on natural community regeneration and succession.



## Track Adjacent Natural Community Encroachment into Chaparral

The use of prescribed burns is intended to prevent the encroachment of adjacent natural communities into chaparral and scrub communities. Areas burned too frequently risk conversion to grassland, whereas too infrequent burning may result in tree community encroachment. Where the use of prescribed burns is not feasible, there is an increased risk of the spread of trees, especially conifers, into chaparral and scrub communities. For example, there are areas in the Santa Cruz Mountains and in the Diablo Range in Henry W. Coe State Park where conifer encroachment has already taken place. This encroachment presents a risk of not only overall loss of habitat extent, but also the loss of key stepping stone patches necessary for maintaining habitat connectivity and corridors for species movement and distribution. The tasks necessary to track the spread of natural communities into chaparral and scrub are listed below.

- Monitor chaparral and scrub stands within reserves through vegetation sampling and periodic interpretation of aerial photographs to ensure that the overall extent of these stands is not declining substantially.
- Adaptively manage the community to prevent encroachment of grassland, oak woodland, and conifer forest in target areas where any significant encroachment is identified.

## Oak and Conifer Woodland Actions

The conservation goal of maintenance and enhancement of oak and conifer woodland communities to benefit covered and other native species serves as the basis for the adaptive management and monitoring strategy. To ensure the long-term persistence of these communities, monitoring actions will focus on the effectiveness of management to enhance the natural processes and native species diversity found in these communities.

Persistence of native plant diversity in oak and conifer communities is dependent on a variety of limiting factors. Seedling recruitment and regeneration within oak woodlands can be limited by invasive weeds and nonnative plants in the understory (Jones & Stokes 1995), mammal herbivory (Borchert et al. 1989; Bartolome et al. 2002; Tyler et al. 2002), and seed predation by feral pigs (Sweitzer and Van Vuren 2002). Depending on timing, frequency, and intensity, fire may have a negative or no effect on recruitment and regeneration in oak woodland (Griffin 1977; Bartolome et al. 2002). However, fire decreases the density of understory weeds and plants, indirectly creating favorable conditions for recruitment and regeneration. Because of the complex interactions of herbivory, grazing, competition from invasive plants, and native species composition, monitoring in the community will focus on determining the primary limiting factors.

In conifer woodlands, plant species recruitment and regeneration are influenced by the buildup of dead plant material on the forest floor and the frequency and

intensity of fire. Periodic fire allows for increased structural and biological diversity by increasing the number of native herbs, creating favorable soil conditions for seedling establishment, and stimulating seed release of closed-cone serotinous pines (Vogl et al. 1988). Like oak woodlands, conifer woodlands can be adversely affected by frequent or intense fires.

Certain areas of oak and conifer woodlands have been severely limited in their ability to recruit and regenerate native species, resulting in the loss of natural processes and native species diversity (Pavlik et al. 1991). These areas will be identified and targeted for enhancement within the study area.

The monitoring program will evaluate the effects of wildfires, prescribed burning, and mechanical thinning on the regeneration and recruitment of dominant plants in oak and conifer woodlands. Additionally, the effectiveness of other enhancement efforts will be evaluated at target sites.

## Assess Condition of Natural Community

Recruitment and regeneration within the oak and conifer woodland communities will be managed through a limited prescribed-burn program, mechanical thinning, and other enhancement tools (e.g., seeding). Documenting the baseline conditions against which change can be effectively evaluated will entail the tasks listed below.

- Using recent aerial photographs, document the range of percent canopy coverage within the Reserve System to estimate structural habitat diversity.
- Use pre-acquisition assessments, site inventories, and other surveys to establish the distribution, abundance, and age structure of each species of oak and conifer within the Reserve System.
- Determine the status of tree recruitment using historical aerial photographs (e.g., Grossinger et al. 2006; San Francisco Estuary Institute 2008). Determine if the current canopy coverage of oaks is increasing, decreasing, or stable within the Reserve System.
- Assess oak stands (e.g., canopy coverage, tree condition, seedling and sapling abundance and survival, population age structure, acorn production) within 2 years of acquisition of each reserve to identify factors that may be limiting ecological functions. If canopy coverage is declining and/or tree recruitment is insufficient, adaptive management actions will be implemented to improve recruitment. These actions will be site specific and may include modifying livestock practices, replanting; fencing saplings; reducing competing herbaceous vegetation; and controlling wild pigs.
- Develop a management-oriented conceptual model for the natural community (see **Figure 7-8** for an example) and identify indicators for community function as well as any critical uncertainties that may require additional directed studies.
- If prescribed burns are feasible and desirable, prepare burn plans that describe pre- and post-burn monitoring to determine effects.

- Begin pre-treatment monitoring of sites considered for enhancement. Develop criteria for measuring success.

## Evaluate Effects of Periodic Disturbance

It is necessary to monitor the responses of the oak and conifer woodlands to wildfires, prescribed burning, and mechanical thinning. The tasks listed below will be carried out to determine the effect of these actions on promoting regeneration and recruitment.

- Develop structural diversity success criteria and compare post-treatment conditions to baseline conditions to measure the effectiveness of prescribed burning on natural community regeneration and recruitment.
- Compare results of mechanical thinning to structural diversity success criteria and baseline conditions to measure the effectiveness of mechanical thinning on natural community regeneration and recruitment.
- Monitor success of burning and thinning to increase native species diversity in mid-canopy and understory of redwood forest, ponderosa pine woodland, and knobcone pine woodland.

## Evaluate Seeding, Planting, and other Enhancement Efforts

The tasks listed below will be conducted to determine the response of enhancement and restoration actions on promoting regeneration and recruitment in oak woodlands.

- Determine indicator species for enhancement efforts and develop success criteria.
- Monitor success of enhancement efforts (seeding and planting, altered livestock practices, fencing saplings, reducing competing herbaceous vegetation, and controlling wild pigs).

## Stream and Riparian Forest and Scrub Actions

Adaptive management and monitoring of stream and riparian forest and scrub are focused on the protection, restoration, and enhancement of these communities for the benefit of covered species and the promotion of native diversity. To ensure the long-term persistence of these natural communities and the species they support, monitoring actions will be the responsibility of the Implementing Entity<sup>5</sup> and will focus on the effectiveness of management to accomplish the following:

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<sup>5</sup> In some cases, it may be appropriate for the Implementing Entity to contract with SCWVD to conduct monitoring activities within some streams, particularly where there is overlap in covered species and monitoring responsibilities between the Habitat Plan and the proposed Three Creeks HCP.

- improve habitat quality and connectivity for native fish, amphibians, reptiles, and riparian birds;
- establish or duplicate the effects of natural disturbance in target areas;
- enhance or restore riparian forest and scrub;
- improve channel function; to reduce anthropogenic sediment input to and storage in streams; and
- decrease the spread of nonnative invasive plant species.

Riparian woodland is dominated by trees and shrubs associated with streams and permanent and intermittent water sources. Riparian scrub is an early successional stage of riparian forest. Due to its dependence on stream channels, riparian vegetation is adapted to a particular disturbance regime. The dominant riparian species (Fremont cottonwood, white alders, and several willow species) generally require bare mineral soil and high light levels for germination. Floods can provide these conditions through the processes of erosion and deposition.

Streams throughout the study area are highly regulated due to the presence of reservoirs and the role of streams as conveyance features for flood protection and water supply (groundwater percolation). Reservoirs modify stream flows, reducing flood peaks and increasing summer stream flow, including during many drought years. The conservation strategy aims to improve the habitat quality of streams and to increase overall ecological functions and values (e.g., native species richness and diversity, vegetative cover, wildlife habitat function). The monitoring program will evaluate the effectiveness of achieving these objectives as well as additional objectives focused on promoting community functions, habitat heterogeneity, and connectivity, including specific success criteria for maintaining hydrologic and geomorphic stream processes or duplicating their effects.

## **Assess Condition of Natural Community**

The establishment of ecological indicators and establishment of success criteria are integral to ensure the maintenance and restoration of habitat quality and ecological functions and values for the covered species. Documenting the baseline conditions against which indicators and success criteria can be effectively evaluated will entail the tasks listed below.

- Use pre-acquisition assessments and site inventories to verify the distribution and abundance of riparian forest and scrub mapped from air photos, and to develop maps of permanent, intermittent, and ephemeral streams.
- Inventory riparian and stream corridors within or outside of the reserves to identify stream segments suitable for enhancement or restoration. Corridors outside reserves will be identified based on importance for covered species and access.

- Use data from USGS gauging stations and/or weather stations to collect information on flood processes and their effects on other hydrogeomorphic processes and riparian communities.
- Assess the connectivity of stream and riparian corridors throughout the study area and between reserves and other public lands.
- Develop a management-oriented conceptual model for streams and riparian forest and scrub (see **Figure 7-8** for an example for grasslands), and identify indicators for community function as well as any critical uncertainties that may require additional directed studies.
- Assess nonnative invasive plants (e.g., giant reed, Acacia), including maps and descriptions of their distribution and abundance; their known or potential effects on ecosystem and hydrogeomorphic functions, native biological diversity, sensitive natural communities, and covered species; and the means and risk of their spread to other areas inside and outside the reserves.
- Investigate and document historical natural disturbance regimes in streams, and document hydrologic changes that may be affecting stream and riparian systems.

## Monitor Riparian Restoration Projects

Monitoring restored riparian habitat will ensure that the natural community is functioning as habitat while providing for ecological processes in the larger landscape. Prior to the initiation of restoration projects, the effects of restoration techniques tested in pilot projects<sup>6</sup> must be evaluated for their efficacy in restoring or duplicating the effects of ecological processes, habitat quality, native cover regeneration, and hydrogeomorphic conditions. It is from these pilot projects that indicator species will be selected and success criteria developed for large-scale restoration projects. The monitoring activities listed below will be the responsibility of the Implementing Entity<sup>7</sup> and will ensure that financial resources are properly allocated and greater success in restoration efforts is achieved.

- Evaluate existing programs for successful monitoring protocols that are appropriate to riparian restoration within the study area.
- Initiate a pilot project to develop restoration measures for individual sites or stream reaches. These measures will include descriptions of plant material requirements (e.g., collected and propagated from local sources); planting and construction methods; and adaptive management and monitoring

<sup>6</sup> Although individual project proponents would not be required to carry out pilot studies, the Implementing Entity will evaluate restoration and/or creation proposal based in part, on pilot studies conducted for the Reserve System. The Implementing Entity will also consider the history of the project proponent performing successful wetland restoration elsewhere and whether the restoration or creation project is consistent with the conservation strategy of the Plan.

<sup>7</sup> The same riparian, stream, wetland, and pond monitoring requirements apply to all Permittees and those under their jurisdiction when aquatic restoration is proposed to offset wetland fees (see Chapter 9, Section 9.4.1).

requirements. The results of pilot projects will guide future restoration efforts.

- Determine indicator species for monitoring restoration, and develop success criteria such as the amount of Shaded Riverine Aquatic (SRA) habitat.
- Monitor the effects of active and passive restoration throughout the Reserve System in target reaches. Success criteria will be developed during Plan implementation and could include the creation of native cover and the restoration of natural hydrogeomorphic and ecological processes as well as native- or covered-species response.
- Monitor the effects of livestock access and livestock exclusion on community composition and recruitment of dominant trees and shrubs.
- Monitor mitigation sites that are beyond their establishment periods (i.e., no longer sustained by irrigation), but have not achieved their success criteria, for stress due to low soil moisture or high evapotranspiration rates. See Chapter 10 *Assurances* for remedial measures if drought occurs (*Drought*).
- Monitor SCVWD natural reservoir inflow data in the study area to determine if the seasonal inflow at the end of April indicate a dry year (near 75% of inflow). See Chapter 10 *Assurances* for remedial measures if drought occurs (*Drought*).

## Evaluate Effects of Periodic Disturbance

It is necessary to monitor the responses of river and riparian communities to periodic flooding. The value of promoting a natural floodplain or allowing target areas to flood will be assessed opportunistically. The tasks listed below will be conducted by the Implementing Entity to determine the response of flooding on creating or maintaining riparian vegetation and improving channel structure.

- Develop structural diversity success criteria and compare post-treatment conditions to baseline conditions to measure the effect of flooding on natural community regeneration and succession.
- Compare results of mechanical thinning (an action which could mimic the effects of natural flooding and drought) to structural diversity success criteria and baseline conditions and measure the effectiveness of mechanical thinning on natural community regeneration and succession.

## Monitor Stream Restoration Projects

Monitoring stream restoration projects will focus on the recreation of the natural hydrogeomorphic processes of confined and degraded stream channels and the restoration of ecological processes. Removal of confined channels restores floodplain connectivity, allowing for greater dispersal distances of target species that use both aquatic and upland habitats. Stabilization of degraded stream channels reduces stream impairment by anthropogenic sources of sediment. The

tasks listed below will be conducted by the Implementing Entity to evaluate the efficacy of stream restoration projects.

- Develop success criteria and monitor success of restored areas in recreating natural hydrogeomorphic and ecological processes.
- Monitor sediment levels both pre- and post-bank stabilization.
- Determine if populations of target species are being restored and/or sustained through improvements in floodplain connectivity and reduced sedimentation. Use survey data from previous monitoring activities and augment the data with additional survey efforts to characterize the seasonal distribution, abundance, and species composition of the target species communities inhabiting restored streams.
- Monitor SCVWD natural reservoir inflow data in the study area to determine if the seasonal inflow at the end of April indicate a dry year (near 75% of inflow). See Chapter 10 *Assurances* for remedial measures if drought occurs (*Drought*).

## Wetland and Pond Actions

Adaptive management and monitoring of wetland and pond communities supports the conservation goal of the maintenance, enhancement, and creation or restoration of ponds and wetland habitats for the benefit of covered species and promotion of native diversity. Monitoring actions will evaluate the effectiveness of management to preserve, enhance, create and restore ponds and to preserve and enhance seasonal and perennial wetlands by increasing native vegetative cover, biomass, and structural diversity within and around the margins. At the same time, monitoring actions will be used to evaluate efforts to reduce the cover and biomass of nonnative invasive plants, access by feral and domestic mammals, and numbers of predatory wildlife and fish species. Monitoring actions will also track the response of target species (e.g., California tiger salamander, California red-legged frog, western pond turtle, tricolored blackbird) to habitat management activities. A reasonable understanding of metapopulation dynamics in the vicinity of these management actions will need to be understood in order to determine whether the actions are causing the change in population level or the population is experiencing typical population fluctuation.

## Assess Condition of Natural Community

The Implementing Entity will conduct monitoring to assess the status and trends of the wetland and pond communities and to evaluate community function. The tasks listed below will be conducted to determine the baseline condition of wetland and pond communities.

- Use pre-acquisition assessments, site inventories, and other surveys to establish the distribution and abundance of ponds and wetlands within and adjacent to the Reserve System. Map the distribution and assess connectivity of wetlands, ponds, and associated upland areas.

- Develop a conceptual ecological model for wetlands and identify indicators for community function as well as any critical uncertainties that may require additional directed studies.
- Prioritize wetlands and ponds for enhancement, restoration, and creation efforts. Potential restoration sites will be identified and selected on the basis of their physical processes and hydrologic, geomorphic, and soil conditions to ensure that successful restoration can occur and be self-sustaining. Identify degraded stream reaches that can be used as pond creation sites.
- Identify wetlands and ponds with abundant nonnative predators or ponds where native species are affected by feral and domestic animal entry. Prioritize these sites for predatory species eradication and exclosures.
- Assess nonnative invasive plants, including maps and descriptions of their distribution and abundance; their known or potential effects on ecosystem function, native biological diversity, sensitive natural communities, and covered species; and the means and risk of their spread to other areas inside and outside the Reserve System.
- Begin pre-treatment monitoring of sites considered for enhancement, restoration, and creation and develop criteria for evaluating success. These criteria will be suitable to evaluate if habitat management increases hydrogeomorphic and ecologic functions, improves habitat value, increases landscape connectivity, and enhances the habitats' ability to support existing and new populations of covered species.
- Identify and track additional threats (e.g., disease, invasive) and manage adaptively to contain these threats.

## **Evaluate Habitat Enhancement, Restoration, and Creation Activities**

It is necessary to monitor the effects of pond and wetland enhancement, restoration, and creation. The tasks listed below will be conducted to determine the response of these actions on increasing native vegetative cover, biomass, structural diversity, and regional connectivity for the benefit of covered species.

- Determine indicator species for monitoring enhancement, restoration, and creation and develop success criteria.
- Initiate pilot project to develop restoration, enhancement, and creation measures for individual sites on the basis of hydrologic conditions; extent and quality of existing habitats (e.g., percent native vegetation and presence/absence of exotic wildlife such as bullfrogs); existing wildlife use; and the potential for adverse effects (e.g., disturbance and/or removal of existing pond/wetland habitat). These measures will include descriptions of plant material requirements (e.g., collected and propagated from local sources); planting and construction methods; and adaptive management and monitoring requirements.
- Determine and quantify changes in habitat that result from wetland and pond enhancement, restoration, and creation. Monitor the survivorship of



planting; quantify vegetated perimeter of pond; and describe habitat quality, connectivity, and species response. Measure success based on criteria described in the monitoring component of the reserve unit management plan.

- Survey wetland and pond capacity and water duration and monitor to ensure that the ecological and hydrogeomorphic functions related to these parameters are maintained or improved.
- Determine use of artificially created ponds by covered species.
- Evaluate the use of wetland-upland complexes by covered species.

### **Evaluate Efforts to Reduce Impacts associated with Livestock and Nonnative Plants and Animals**

It is necessary to monitor the results of efforts to reduce impacts caused by livestock and nonnative species on pond and wetland habitats. The tasks listed below will be conducted to evaluate these effects.

- Determine the effect on the vegetative community and the relative benefit to target covered species of different management treatments such as access/exclusion by livestock and feral pigs, pond draining, and predator control.
- Monitor and record populations and incursions of nonnative predators in target wetlands and ponds.
- Evaluate the success or potential adverse effects of any herbicide applications used to control nonnative plants in target areas.

## **7.3.3 Species-Level Actions**

The Implementing Entity will conduct monitoring to assess the status of covered species and to determine the extent to which the conservation strategy described in Chapter 5 is being implemented and the extent to which biological goals and objectives for species are being met. Species-specific issues and tools are described in **Appendix J** *Monitoring Issues and Tools*. The section below summarizes the specific monitoring actions that the Implementing Entity will carry out to track environmental issues at the species level and ensure that species-level goals and objectives are being met.

Species monitoring will address the following issues relevant to the Plan.

- Status and trends of covered species and other relevant species within the Reserve System (i.e., status and trends monitoring).
- The response of covered species to HCP/NCCP species-specific conservation measures and adaptive management (i.e., effects-of-management monitoring).

- Directed studies to resolve critical management uncertainties for some covered species (i.e., directed studies).

In some cases covered species are the response variables for effects-of-management monitoring at the community level. In those cases, monitoring is described in Section 7.3.2 *Natural Community–Level Actions* above. Species have been categorized into three groups for the purposes of prioritizing monitoring and maximizing efficiencies (see Group numbers in following sections). The grouping of each species will be re-evaluated every 5 years, or if listing status changes, and species may move between the three categories during the course of Plan implementation. The target species for status and trend surveys in acquired parcels will be based on and informed by species models, CNDDDB data and pre-acquisition assessments.

Group 1 species include most of the covered species that are currently listed as endangered or threatened by either state and/or federal wildlife agencies. In most cases, the study area constitutes a critical portion of the species' range. Baseline surveys will be initiated within 1 year of land acquisition. Species-specific conceptual models for Group 1 species will be initiated within 1 year of implementation. Within the year, monitoring variables and additional indicators (biotic or abiotic) will be selected. A survey schedule will be developed to ensure that species status is monitored at the appropriate seasonal periods within the year.

Initially, Group 1 species will be monitored on an annual basis; however, the frequency of monitoring may be adjusted on a species-by-species basis once the status of species in the Reserve System is established. For example, if red-legged frogs have been monitored annually for 15 years and their populations are known to be stable or growing, annual monitoring may be adjusted to bi-annual monitoring in order to reserve budget for other conservation or monitoring actions. Recommended annual monitoring is for species status monitoring only (i.e., not trends monitoring). However, monitoring frequency for species addressed in finalized USFWS Recovery Plans will not fall below the recommended frequencies in these plans. For example, at a minimum, Coyote ceanothus will be monitored every 3 years, as suggested in *The Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998).

Targeted studies and monitoring related to the effects of management actions will take place on a time schedule that is relevant to the specific effort at hand, and monitoring schedule for these activities will be developed on a case-specific basis. Success criteria and monitoring protocols will be developed to incorporate monitoring results into the adaptive management strategy. Finally, additional threats to species survival will be identified and tracked. These monitoring actions are common for all Group 1 species within the study area. Monitoring will ensure continued species existence within the study area by tracking species population status and trends.

Group 2 species are not currently listed, but the study area constitutes a critical portion of the species' range. On average, a moderate level of monitoring effort

will be needed for these species. Baseline surveys will be conducted within 2 years of land acquisition. Species-specific conceptual models will be developed on an as-needed basis. Monitoring variables and additional indicators (biotic or abiotic) will be selected within 1 year. A survey schedule will be developed to ensure that species status is monitored every 2–3 years. Success criteria and monitoring protocols will be developed to incorporate monitoring results into the adaptive management strategy. Finally, additional threats to species survival will be identified and tracked. These monitoring actions are common for all Group 2 species within the study area. Monitoring will ensure continued species existence within the study area by tracking species population status and trends.

Species in Group 3 may or may not be listed but the study area is not considered a critical component of the species' range. A relatively lower monitoring effort will be undertaken to establish the status and trends of these species. Baseline surveys will be conducted within 5 years of land acquisition. Monitoring variables and additional indicators (biotic or abiotic) will be selected. A survey schedule will be developed to ensure that species status is monitored at least every 5 years but up to annually, as appropriate. Success criteria and monitoring protocols will be developed to incorporate monitoring results into the adaptive management strategy. Finally, additional threats to species survival will be identified and tracked. These monitoring actions are common for all Group 3 species within the study area. Monitoring will ensure continued species existence within the study area by tracking species population status and trends.

## Monitoring Partial Impact to Plant Occurrences

In addition to status and trends monitoring within the Reserve System, covered plant occurrences that may be partially adversely affected by covered activities will be monitored. The purpose of the monitoring will be 1) to assess whether the impact reduces the long-term viability of the occurrence and whether supplemental management actions are feasible and warranted, and 2) to determine whether an additional occurrence must be protected, enhanced, or created in the Reserve System to offset this partial impact (as defined by Chapter 6, Section 6.6.2, subheading *Condition 20 Avoid and Minimize Impacts to Covered Plant Occurrences*). Baseline data will be collected before the covered activity is implemented.

Covered plant occurrences that are partially permanently affected (i.e., long-term viability is not reduced below the thresholds described in Chapter 6, Condition 20) by covered activities will be monitored by the Implementing Entity unless the impact is less than 5% of the total population size as measured by the number of individuals. If the impact is less than 5% of the total occurrence size, then the impact is not considered significant with regard to long-term viability and will not require monitoring nor will it count as a permanent impact. This exception applies to all covered plant species except Coyote ceanothus.

Specific monitoring protocols and success criteria will be developed during implementation as appropriate for each covered plant species, according to the

guidelines discussed here and in Condition 20 in Chapter 6. It is possible that only a portion of the occurrence will be located on the covered activity project site. In such instances, the monitoring protocol will address this issue. Three possible monitoring approaches include the following:

1. If the landowner agrees, the Implementing Entity will obtain access to the adjacent sites on which the rest of the plant occurrence is located, and surveys will include the entire occurrence.
2. If access to adjacent site(s) is not possible, or if for some other reason it is not feasible to survey the entire occurrence, then an alternative will be developed to estimate the extent and condition of the adjacent portion of the occurrence.
3. If only a small portion of the occurrence is on adjacent properties, then only the portion of the occurrence on the project site will be monitored and assessed for viability. The determination whether this is a full impact will be made based on the results for only the accessible portion of the occurrence.

Analysis of the monitoring results for annual species will take into account annual population variation that may have affected the baseline data. For example, if the baseline year was exceptionally wet, an annual population may have been very high. Subsequent reductions in population could be partially caused by drier conditions as well as impacts from the covered activity. If extreme or unusual climate conditions affect the species, then monitoring will be extended 1 or 2 years, as appropriate to assess impacts and success.

For annual species, the minimum post-construction monitoring period will be 5 years. Monitoring will include estimates of percent cover and number of individuals. An occurrence will be assumed to retain long-term viability and will not require replacement in the reserve system if the decline in occurrence size and percent cover from pre-project conditions is less than 25% over the monitoring period, unless site-specific conditions otherwise suggest substantial declines in viability.

For perennial species, the minimum post-construction monitoring period will be 3 years. Monitoring will include estimates of percent cover, recruitment of seedlings if impacts included removing individuals, and measurements of adult plant health (e.g., signs of disease, herbivory, nutrient deficiencies, etc.). An occurrence of a perennial covered species will be assumed to retain long-term viability and will not require replacement in the reserve system if the decline in seedling recruitment and percent cover from pre-project conditions is less than 25% over the monitoring period, unless site-specific conditions otherwise suggest substantial declines in viability.

**Tables 5-1c and 5-1d** correlate monitoring actions with biological goals and objectives for wildlife and plant species, respectively. Species-specific monitoring actions are discussed in detail below.

## Bay Checkerspot Butterfly (Group 1)

### Document and Monitor Species Status

Surveys for Bay checkerspot butterfly populations will be conducted on reserve lands with modeled serpentine grassland habitat. Two types of surveys will be conducted within the Reserve System: (1) surveys of larval and adult host plants and reconnaissance level surveys for adult butterflies in suitable but unoccupied habitat, and (2) surveys of post-diapause larvae in occupied habitat. Surveys will be conducted at the frequencies discussed above (i.e., annually) during either the appropriate flowering period for larval host plants, during the late larval period (February–March), or during the peak of the flight period for adults. Surveys will be consistently conducted at the same time of year to facilitate data analysis. Additional information on survey protocols and methodologies is described in the species account for Bay checkerspot butterfly in **Appendix D**.

During implementation, previously identified (through expert opinion and habitat model, **Appendix D**) Bay checkerspot butterfly habitat within the Reserve System will be surveyed for the presence of larval host plants. This information will be used to verify the Habitat Plan's Bay checkerspot butterfly population map in the Reserve System. This will be followed by annual reconnaissance level surveys for adult butterflies during the peak of the flight period. This will generally be pedestrian surveys through modeled habitat and butterflies will be identified with the aid of binoculars (Santa Clara Valley Water District 2005; Santa Clara Valley Transportation Authority 2006; WRA Environmental Consultants 2006). These surveys will serve to detect shifts in distribution and new colonization of habitat within the Reserve System. Following colonization, a more rigorous sampling approach will be used as described below. Surveys for new populations will be focused in areas of potential habitat near the largest patches of occupied habitat (Launer and Murphy 1994).

In areas where known Bay checkerspot butterfly populations persist, surveys for post-diapause larvae will occur to gain an estimate of relative abundance of individuals. Protocols for these surveys will use the best techniques available at the time, but in general will include annual sampling at permanent plots stratified to include microclimates present as the result of changes in topography and management regime (Santa Clara Valley Transportation Authority 2006; WRA Environmental Consultants 2006). Additional techniques such as timed larval counts will also be used. This can generate numbers of larvae observed per unit time (typically 10 minutes) and gives some indication of abundance in a given area (S. Weiss pers. comm.). Initially this protocol will establish an estimate of the baseline for each population identified in **Appendix D**. Baseline numbers of individuals may be known because most of these sites are already surveyed annually. In these areas all available existing information will be used and every attempt will be made to reduce the overlap in the survey efforts for efficiency.

Monitoring protocols will be developed to assist the Implementing Entity in demonstrating compliance with species occupancy requirements described in

Chapter 5, Section 5.3.1, subheading *Acquisition of Modeled Habitat for Covered Species*.

## **Evaluate Covered Species Response to Habitat Enhancement and Restoration**

It has been shown that without some form of grassland management (e.g., grazing, mowing, seeding, and burning), serpentine grassland quickly becomes overrun with nonnative plants, and habitat quality decreases for Bay checkerspot butterfly (Weiss 1999) to the point where the species may be extirpated from a site. Accordingly, monitoring activity is ongoing to determine Bay checkerspot butterfly population response to grassland management (Weiss 1999; Fleishman et al. 2000; Hellman 2002; Santa Clara Valley Transportation Authority 2006; WRA Environmental Consultants 2006). As management techniques are implemented within the Reserve System on unoccupied sites, the number and distribution of larval host plants will be documented to determine how habitat quality has changed under different management regimes. In areas where Bay checkerspot butterfly populations already occur, population numbers will be monitored to determine how they are responding to management techniques.

## **Evaluate Use of Translocation to Establish New Populations**

One important biological goal of this Plan is to increase the number of Bay checkerspot butterfly populations in the study area. To this end, serpentine habitat will be acquired and managed appropriately to support the species. During years when populations are at peak numbers, some individuals may disperse to these new reserves; it is hoped that, over time, there would be reproducing populations on those sites in most years. However, if acquisition and management occur but dispersal does not, then translocation of butterflies could be used to establish populations in new reserves (Harrison 1989). A translocation program would be conducted in a controlled and repeatable fashion that allows for quantification of the number of individuals gained or lost during the experimental process. Translocation efforts will be closely coordinated with CDFG, USFWS, and other species experts. Thresholds for loss of individuals would be established beforehand. Translocation would need to be approved by the Wildlife Agencies.

These experimental translocation efforts would be monitored using the methods discussed above.

## **Monitor Additional Threats**

Although serpentine grasslands are typically more resistant than many other vegetation types to invasion by nonnative species, if the habitat is left unmanaged nonnative plants will eventually dominate serpentine grasslands. Monitoring

how grassland species richness changes under various management techniques is essential to understanding which techniques are most effective at retaining habitat for Bay checkerspot butterfly.

A number of pollutants, especially nitrogen-based pollutants, threaten Bay checkerspot butterfly. Deposition of excess nitrogen on serpentine grasslands can alter plant composition. Deposition of nitrogen acts to fertilize the nutrient-poor serpentine soil, exacerbating the problems caused by nonnative species (Weiss 1999). Continued monitoring of nitrogen deposition on serpentine soils and the benefits of managed grazing and controlled burns in areas such as Silver Creek Hills, Tulare Hill, and Santa Teresa County Park (**Appendix E Draft Estimation of Contributions to Deposition of Nitrogen in Santa Clara County for the Santa Clara Valley Habitat Plan**) as well as more precisely quantifying how an increase in passenger and commercial vehicle trips and other new industrial and nonindustrial sources will degrade these habitat types will continue to be a focus under this Plan. The monitoring report prepared each year will document at least one dry season and one wet season nitrogen deposition rate from monitoring conducted by the Habitat Plan or other sources.

## California Red-legged Frog (Group 1)

### Document and Monitor Species Status

Early in the breeding season (November–February, depending on local population behavior), when adult California red-legged frogs typically move into breeding habitat, surveys will be conducted to determine presence/absence of potential breeding adults. Surveys during the breeding season will be conducted based on the most recent protocols adopted by USFWS and CDFG (e.g., U.S. Fish and Wildlife Service 2005)<sup>8</sup>, coordination with the monitoring efforts of other local agencies (e.g., Santa Clara Valley Water District 2005), and best available science.

Once it is established that potential breeding adults are present, a more in-depth survey during the breeding season, as defined by USFWS protocols, will be conducted to determine the size of the breeding population and an estimate of breeding success.

Surveys of all potential breeding habitat will be conducted on land acquired for the Reserve System. Initial surveys will be used to document baseline levels for population monitoring during the permit term and in perpetuity. This baseline information will document the factors listed below.

- Ponds, wetlands, or stream reaches occupied by adult red-legged frogs.
- Adult, larva, and egg mass numbers.

<sup>8</sup> Survey protocols developed by the Wildlife Agencies often have the goal of reliably detecting presence of a species within one or two seasons, which is the time available for most project planning cycles. The goal of surveys on reserve lands will be to definitively determine presence or absence. Wildlife Agency survey protocols may or may not address this monitoring goal.

- Unoccupied breeding habitat that may have the potential to support breeding populations. This item will include an evaluation of the possible factors hindering successful breeding at that location.
- Assessment of upland habitat for potential refugia around occupied and potential breeding habitat.
- Presence of bullfrogs and nonnative, predatory fish species in occupied or potential habitat.
- Presence of other factors (threats) seemingly affecting breeding success at a given location where breeding is occurring.
- Estimate of the distance between known or potential breeding sites to help guide creation or enhancement of more robust populations.

This information will be documented in GIS layers and used to prioritize areas for enhancement and restoration. The management actions for target upland areas surrounding breeding habitat will also be described. This will aide in prioritizing potential unoccupied breeding habitat to be enhanced or restored to support breeding adults in the future.

In years following baseline data collection, visual monitoring for California red-legged frog population status will take place annually, during the breeding season, as defined by USFWS protocols. Egg mass counts and adult counts obtained during visual surveys will be used to determine the local population of California red-legged frogs and will contribute to an overall population status and trends assessment across the Reserve System.

If sufficient information is not obtained via visual monitoring—dip-netting, seining, hand catching, or other methods developed during implementation will be used to capture adults, juveniles, metamorphs, and larvae in habitat where adults have been documented during protocol-level surveys. Those more intensive methods will only be employed every 5 years to minimize impacts on local populations.

Monitoring protocols will be developed to assist the Implementing Entity in demonstrating compliance with species occupancy requirements described in Chapter 5, Section 5.3.1, subheading *Acquisition of Modeled Habitat for Covered Species*.

## Evaluate Covered Species Response to Flow Regulation

Flows could also change as a result of dewatering events described in Chapter 2, *Land Use and Covered Activities*. If California red-legged frog populations are found in streams hydrologically affected by existing dams in the permit area, the Implementing Entity will monitor the effects of flow regulation on the species.



## Evaluate Covered Species Response to Habitat Enhancement, Restoration, or Creation

Potential breeding habitat that is targeted for enhancement, restoration, or creation of habitat will be monitored after treatment to determine the response of breeding California red-legged frogs to habitat-management actions. The relative success of different management actions for maintaining or increasing red-legged frog populations will be assessed to guide future management efforts.

The effectiveness of enhancement and restoration management actions in occupied breeding habitat will be monitored by observing changes in the number of egg masses detected during breeding-season surveys (as defined by USFWS protocols) over time. In addition, the numbers of adults, juveniles, meta-morphs, and larvae that are observed during those surveys will be used to help determine how population levels are responding. The available breeding habitat will be quantified in acres, and population numbers will be recorded as the number of detections per acre in ponds and wetlands. In streams, breeding surveys will cover the amount of riverine habitat that a surveyor can comfortably survey during an 8-hour period. Stream surveys are based on linear miles. In order to calculate acreage the width of the wetted stream channel will be taken for every 500 feet of linear survey and an areal estimate will be calculated. This area will be quantified in acres, and the number of detections per acres will similarly be recorded. Reserve unit management plans will identify which stream reaches, ponds, and wetlands will be monitored, and at what frequency the monitoring will occur, to determine habitat availability and population response to management actions. Those habitat features will be monitored to record changes over time. Monitoring frequency will be established in the reserve unit management plan.

In order to initially determine the peak egg-laying month for different parts of the Reserve System additional egg mass surveys will be conducted once a week, for select sites, during the peak egg-laying period (Bobzien and DiDonato 2007). Depending on rainfall and other seasonal factors, surveys could begin up to two weeks prior to or two weeks following the peak egg-laying month. March has been noted as the peak egg-laying period for California red-legged frogs in nearby Alameda and Contra Costa Counties (Bobzien and DiDonato 2007). The peak egg-laying period for the Reserve System will be determined by surveying the potential and known breeding sites once a week starting in the beginning of January until no more new egg masses are observed, in order to determine the peak egg-laying period for individual water bodies within the Reserve System. If egg masses are detected in the first round of surveys, the following year's surveys will begin earlier (1–2 weeks) so as to establish when the onset of breeding typically occurs. Once the peak egg-laying period is determined for different parts of the Reserve System, these weekly egg-mass surveys would cease and singular egg-mass surveys would be completed at the same time as visual surveys. The overall reproductive output (i.e., number of egg masses) will be recorded during the survey period and each will be recorded with a handheld GPS unit. Newly created ponds will be monitored in the same manner.

In some instances more specific monitoring will be conducted. For example, radiotelemetry studies have been designed to determine how a local population (breeding pond) of red-legged frogs uses the upland areas around that pond during the breeding and non-breeding season (Rathbun and Murphy 1996; Bulger et al. 2003). Radiotelemetry studies may be done in the study area if the results will significantly benefit the Monitoring and Adaptive Management Program for the California red-legged frog. Radiotelemetry could be used to determine how breeding populations from several ponds or streams interact and if breeding red-legged frogs move between ponds during or between breeding seasons. Finally, there is some speculation that creating new pond habitat is a good method for increasing the red-legged frog population in a given area but that there may be little or no interaction between pond-breeding frogs and stream-breeding frogs (S. Bobzien pers. comm.). Monitoring adults using radiotelemetry would help determine whether red-legged frogs are using stream, pond, and wetland habitat within the Reserve System, or if they are more selective in their habitat use. Once conceptual models for red-legged frog have been developed, implementation of these studies will be prioritized on the basis of data gaps identified and the information needed to more effectively manage frogs in the study area.

Additional habitat enhancements, such as changes in flow regimes, could be implemented in streams that support California red-legged frog habitat. Monitoring how these changes affect habitat quality and different life stages of development will be important.

## **Evaluate Use of Adjacent Uplands and Nonbreeding Aquatic Habitats**

Monitoring habitat condition will occur in upland areas and nonbreeding stream habitats adjacent to occupied breeding habitat. Monitoring of upland habitat will also occur adjacent to unoccupied breeding habitat that is being actively managed for California red-legged frogs. Although unoccupied breeding habitat may not be the result of deficiencies in upland habitat, problems in upland habitat may contribute to lack of breeding, and monitoring will help identify threats. Due to the importance of both breeding and upland habitat to the success of this species, this information will be used to determine what the limiting biological factors are for unoccupied breeding habitat.

In general, changes in breeding populations over time will be correlated with land management in surrounding upland areas. Monitoring for changes in breeding success will help determine how those management techniques are affecting the population. For example, if prescribed burning, or mowing to mimic burning, is instituted in uplands surrounding California red-legged frog breeding habitat, and the population increases in that breeding pool over time, then some of that success might be attributable to the upland management techniques. In addition, monitoring the response of ground squirrel colony size and burrow density to upland management techniques will be used as a proxy to determine the quality and quantity of upland habitat available for California red-legged frogs. The response of riverine populations of red-legged frogs will be

monitored with respect to changes in riparian vegetation and corridor widths as the result of enhancement or restoration activities that occur under this Plan.

## **Evaluate Response of Predator Control Programs**

During baseline surveys to document the status of covered species populations, breeding habitat occupied by nonnative species will be identified. These data will inform management actions within the Reserve System. Subsequent surveys for bullfrogs and predatory fish will be conducted to determine the effectiveness of eradication efforts. Threat-eradication efforts for California red-legged frog will focus on reducing or eliminating bullfrogs and predatory fish as the primary threats to tadpole persistence (Lawler et al. 1999). Post-treatment surveys will also allow for an assessment of the response of native amphibian populations to invasive species eradication.

## **Monitor Additional Threats**

Monitoring will be conducted for diseases including chytrid fungus and any other harmful diseases that are discovered in the Reserve System during implementation. This monitoring will include assessing the effectiveness of any disease-control measures. Spreading of these diseases becomes a concern when biologists access more than one breeding site in a short period of time. Biologists will utilize accepted antiseptic protocols during all aquatic survey work to minimize the potential for cross-contamination.

# **Western Burrowing Owl (Group 1)**

## **Document and Monitor Species Status**

The Implementing Entity will carry out two separate survey efforts in support of the burrowing owl conservation strategy—nest surveys and population surveys.

### **Nest Surveys**

Each year, the Implementing Entity will coordinate with survey efforts conducted at known nesting sites in the permit area including surveys conducted at San José International Airport, Moffett Federal Airfield, Shoreline at Mountain View, VTA Cerone bus maintenance yard, and San Jose/Santa Clara Water Pollution Control Plant buffer lands. Additional locations will be surveyed in subsequent years as new colonies are formed or discovered over the permit term. The Implementing Entity will coordinate with survey staff at the first three locations to obtain data from ongoing annual survey efforts and will provide guidance on the survey information required to inform regional data collection. The Implementing Entity will be responsible for conducting surveys at the last two locations (and any new colonies that may be discovered during the permit term) and will use the same methodology across sites to ensure consistency. All surveys will be conducted consistent with California Burrowing Owl Consortium

methodology (California Burrowing Owl Consortium 1993). Data collected from the annual survey sites will be used to track the number of adult burrowing owls and to assess reproductive status. Information will contribute to a rolling population viability analysis in the region. Collectively, the data will inform the adaptive management of this species and will help prioritize use of funds for burrowing owl conservation under the Plan. The first annual survey will occur during the first full year of Plan implementation and each year thereafter.

### **Population Survey**

The Implementing Entity will also coordinate with other South Bay local governments, special districts, and non-profit organizations every 3 years to assess status of the burrowing owl population in the study area and the expanded study area for burrowing owl conservation. These survey efforts are aimed at identifying occupied and potential burrowing owl habitat in the four burrowing owl conservation regions. The focus of this larger survey effort is to document population expansion into new areas. This 3-year survey will help determine whether the range of nesting burrowing owls in the study area and expanded study area for burrowing owl conservation is stable and, possibly, expanding. Analysis of the survey results will encompass the areas surveyed annually, areas with historical or recent occurrences of nesting burrowing owls, and areas with highly suitable habitat that has not been occupied in the past. The initial population survey, which will occur during the first full year of implementation, will build on information collected on burrowing owl nest locations during the Habitat Plan planning process (Barclay 2008).

### **Evaluate Species Response to Habitat Protection and Enhancement**

Monitoring the response of the western burrowing owl population to prescribed management will be difficult because population numbers are very low and the site fidelity of nesting owls is largely unknown in the study area and expanded study area. To gain a comprehensive understanding of how the population and individual nesting pairs respond to management actions, multiple approaches will be used. By establishing periodic surveys of available nesting and potential nesting habitat, a more precise estimate of the number of nesting pairs in lands protected and/or managed for burrowing owls will be made. The number of nesting pairs in the study area and expanded study area can then be tracked over time to determine whether the numbers change as more habitat is managed for burrowing owls. Where burrowing owls occur on lands managed under the Plan, the response of individual nesting pairs will be tracked to determine how management activities affect productivity. For example, if there is an area where burrowing owls are known to nest and grazing is introduced to stimulate grassland diversity, the productivity of those nesting owls will be tracked to determine if grazing has an effect on the owls' propensity to return to the site each year and the number of young produced over time.

In many cases the density and distribution of California ground squirrels and grassland height will be used as a proxy for assessing the quality and quantity of burrowing owl habitat within the burrowing owl management areas. Baseline

surveys to establish habitat condition, including the distribution and burrow density of California ground squirrels in management areas, will be conducted. The results of these surveys will be used to update the burrowing owl habitat model. An increase in the distribution of California ground squirrels in modeled habitat in response to management actions will be considered an increase in habitat availability for western burrowing owl. Overall success of efforts to promote burrowing owl will be measured by a positive growth rate in the PVA for this species (based on annual increases in the number of adults owls), and by the number of acres managed for burrowing owls.

In areas where California ground squirrels are not present and are unlikely to be reestablished, artificial burrow complexes may be installed to create nesting habitat. These installations will be monitored in accordance with accepted CDFG protocol to determine if they are supporting nesting owls.

Additional monitoring will be required if a program to increase reproductive success of burrowing owls in the South Bay are implemented (Tier 3 conservation actions, **Appendix M**). General success criteria will be defined in close coordination with the Wildlife Agencies. Criteria will be set during the Tier 2 surveys, and based on the success or failure of the program, interim checkpoints will be established to determine if/when the program should cease. Monitoring will include the evaluation of a pilot reintroduction program and a pilot study to determine other methods to increase reproduction of local burrowing owls. Success and the feasibility of replicating the reintroduction program at additional locations, as well as the effectiveness of methods to increase reproduction, will be evaluated.

## **Monitor Additional Threats**

Rapid changes in grassland habitat, such as natural or prescribed burns, could have a temporary effect on burrow availability and prey availability for western burrowing owls. To determine how burrow availability is affected, California ground squirrel colonies will be monitored before and after natural or prescribed fires within managed areas. By monitoring the recovery period for grassland habitat, including variables such as size of the reestablished ground squirrel colony, overall habitat quality and quantity can be assessed.

# **California Tiger Salamander (Group 1)**

## **Document and Monitor Species Status**

During the breeding season, which begins soon after the first cool rains of late-fall and early winter, adult California tiger salamanders migrate to breeding pools. Before hatching and after larvae hatch out and are developing, the probability of detecting presence is highest. Surveys will be conducted during the breeding season using the most recent methodologies that are accepted by USFWS and CDFG. Monitoring actions that take place under the Plan will be

coordinated with those of other local agencies to ensure that unnecessary redundancies are eliminated and that data can inform both processes (e.g., Santa Clara Valley Water District 2005).

During the non-breeding season, when individuals are underground in upland refugia, this species is more difficult to detect and methods to do so are often cost prohibitive. To determine quality and quantity of upland habitat for this species, surveys for California ground squirrel colonies and pocket gopher activity will serve as a surrogate. This is discussed further below. In general, it will be assumed that if upland habitat is suitable and within the range of known dispersal distances from an observed breeding location, then the upland habitat is assumed to be occupied as well. Densities of adult salamanders using upland habitat in a given area will be extrapolated from densities of adult and larval salamanders detected in breeding habitat through seining or other methods.

Surveys of potential breeding habitat in lands acquired for the Reserve System will be conducted according to the survey schedule outlined above. Once it is established that potential breeding adults are present, a more in-depth survey during the breeding season, based on approved methodologies, will be conducted to determine an estimate of the size of the breeding population and an estimate of breeding success. Potential breeding habitat is defined as seasonal and some perennial wetlands, including stock ponds. Some riparian areas within stream corridors could also support breeding tiger salamanders if there are adjacent wetlands or large, slow water areas (e.g., side channels or scour pools) and no predatory fish species. This information will be used to document baseline levels for population monitoring during the permit term and beyond in areas where repeatable testing is appropriate. Baseline information will comprise the following.

- Ponds/wetlands occupied by tiger salamander larvae and/or breeding adults.
- Adult, larva, and egg mass numbers.
- Unoccupied breeding habitat that may have the potential to support breeding populations. This item will include an evaluation of the possible factors hindering successful breeding at that location.
- Assessment of upland habitat around occupied and potential breeding habitat.
- Presence of bullfrogs and predatory fish species in occupied or potential habitat.
- Signs suggesting presence of non-native salamander alleles (hybrid adults, paedomorphs).
- Presence of other factors (threats) that appear to affect breeding success at a given location where breeding is occurring.
- Estimate of the distance between known or potential breeding sites to help guide creation or enhancement of more robust populations.

This information will be documented in GIS layers and will be used to prioritize areas for enhancement/restoration. The management actions for target upland areas surrounding breeding habitat will also be described.

In years following baseline data collection, monitoring California tiger salamander population will take place during each breeding season at the survey frequencies described above in the introduction to Section 7.3.3 *Species-Level Actions*. Larval salamander numbers in select breeding pools will be used to determine the local population of salamanders, within the known dispersal distance from the breeding pool and will contribute to an overall population status and trends assessment across the Reserve System. The breeding pools that will be monitored within each Reserve Management Area will be outlined in its associated reserve unit management plan along with monitoring guidelines and population targets.

Additionally, upland habitat condition and use will be monitored during the breeding season within 0.5 mile of a representative sample of known breeding pools (Trenham and Shaffer 2005). Evaluation of upland habitat condition will be based on best available scientific information at the time. Changes in salamander numbers in breeding pools will be correlated with surrounding land uses. For example, if grazing is implemented as a management activity in an area where grazing previously did not occur, the impact that this has on habitat quality for tiger salamanders will be discerned by determining how it affects the breeding activity at known breeding ponds in the area.

Monitoring protocols will be developed to assist the Implementing Entity in demonstrating compliance with species occupancy requirements described in Chapter 5, Section 5.3.1, subheading *Acquisition of Modeled Habitat for Covered Species*.

## **Evaluate Covered Species Response to Habitat Enhancement, Restoration, or Creation**

Ponds or wetlands that are targeted for restoration, enhancement, or creation will be monitored to determine the response of breeding tiger salamanders to habitat management. Management activities will be correlated with population numbers, and the relative success of different techniques on maintaining or increasing tiger salamander populations will be assessed to guide future management efforts. Newly created ponds and enhanced or restored wetlands and ponds will be monitored for target species response, including presence/absence surveys for tiger salamander larvae and breeding adults.

In addition, upland areas near created, enhanced, or restored breeding habitat will be surveyed for habitat suitability. While surveying for the presence of individuals can be cumbersome (e.g., scoping or excavating ground squirrel burrows) and time consuming, determining accessibility of upland habitat from breeding ponds and its suitability for non-breeding season use is a simpler undertaking. Surveyors will determine whether there are any barriers between breeding habitat and upland sites. Surveyors will also determine if there are sufficient underground refugia available for tiger salamanders during the non-breeding season. Changes in this upland habitat availability and suitability will be correlated with breeding population numbers. For example, if the size of a ground squirrel colony is reduced following a prescribed burn and the next year

the California tiger salamander breeding population is substantially reduced, then it might be inferred that prescribed burning had a negative effect on the tiger salamander population during this brief window.

Similarly, if the vegetative communities surrounding breeding habitat change due to restoration or enhancement (e.g., oak woodland planting, burning, grazing, tree thinning), the impacts on the breeding tiger salamander population will be tracked and its relationship with the management in these upland areas will be inferred. In select instances, directed studies might be developed to better understand how complex management issues influence tiger salamander populations over time.

## **Evaluate Use of Burrows**

Monitoring habitat conditions will occur in upland areas adjacent to a representative sample of occupied breeding habitat. Monitoring of upland habitat will also occur adjacent to unoccupied breeding habitat that is being actively managed for California tiger salamander. Due to the importance of both breeding and upland habitat to the success of this species, this information will be used to determine what the limiting biological factors are for unoccupied breeding habitat. Monitoring the size and burrow density of ground squirrel colonies adjacent to breeding habitat will be essential. Monitoring the response of ground squirrel colony size and burrow density to upland management techniques will be used as a proxy to determine the quality and quantity of upland habitat available for California tiger salamanders.

To develop more detailed information on how California tiger salamanders use underground refugia in upland habitat, burrows and other refugia on the Reserve System can be surveyed using a burrow probe (also known as a “digiscope”). This tool provides the means to confirm or deny occupancy of burrows in upland areas, though this method is not very cost effective for a large Reserve System. Rather, this technique can be used periodically to test the assumptions about upland habitat quality characteristics. In general, it will be assumed that if breeding habitat is occupied then adjacent uplands within typical dispersal distance are being utilized as well.

## **Evaluate Response of Predator Control Programs**

During baseline surveys to document the status of native species populations, a description of breeding habitat that is occupied by bullfrogs and predatory fish species will also be completed. These data will inform management actions within the Reserve System. Subsequent surveys for bullfrogs and predatory fish will be conducted to determine the effectiveness of eradication efforts. This will also allow for an assessment of the response of native amphibian populations to nonnative species eradication efforts.



## Monitor Additional Threats

Monitoring will be conducted for diseases including chytrid fungus and any other harmful diseases that are discovered in the Reserve System during implementation. This monitoring will include assessing the effectiveness of any disease-control measures. Spread of these diseases becomes a concern when biologists access more than one breeding site in a short period of time. Biologists will utilize accepted antiseptic protocols during all aquatic survey work to minimize the potential for cross-contamination.

Nonnative salamanders are known to occur in the study area and are hybridizing with California tiger salamanders covered under this Plan. The degree of hybridization however, varies greatly within the Plan Area. As described in Chapter 5 and **Appendix K**, the management strategy for hybrid salamanders will be incorporated into the reserve unit management plans developed for portions of the Reserve where nonnative tiger salamanders and/or suspected hybrids are detected. Adaptive management involving close coordination with USFWS, CDFG, and other species experts will be critical in addressing this threat during Plan implementation. At a minimum, location, population size, and general condition of nonnative and suspected hybrid populations of salamanders will be documented. The response of native salamanders (e.g., outcompetition, hybridization) will also be monitored closely along with population response to any management actions that are implemented in accordance with the hybridization plan described in Chapter 5 and **Appendix K**.

## Tiburon Indian Paintbrush (Group 1)

### Document and Monitor Species Status

The Kirby Canyon Butterfly Trust closely monitors both known populations of Tiburon Indian paintbrush in the study area. These data will be used as baseline population data for this species. Plant surveys on acquired parcels will be conducted to document new populations.

Tiburon Indian paintbrush status will be monitored over time in relation to baseline population sizes; baseline data will serve as the standard against which future changes are measured. Monitoring will evaluate changes over time and the response of plant populations to management activities. Monitoring will include data on population size, numbers and location; age classes; seedling survival and health and vigor of populations. Location data will be collected by GPS and documented in GIS layers. In addition to annual monitoring, monitoring will always be conducted following events that may have strong effects on population size and condition (e.g., fire, severe weather, human impact). Monitoring methods will be based on up-to-date, repeatable methods of tracking population status over time.

## **Evaluate Covered Species Response to Habitat Enhancement**

Monitoring the response of Tiburon Indian paintbrush to various grazing regimes is already occurring in the study area. This monitoring will continue under the Plan, especially if new management techniques are introduced as a result of Plan implementation. Monitoring surveys will follow appropriate protocols and occur during the flowering period for this species, which is typically April–July. In addition to acquiring data on the target population, studies may be carried out to document changes in grassland communities in and around known populations of Tiburon Indian paintbrush. Changes in plant status will be correlated to changes in the management regime to help determine whether management actions have successfully created opportunities for the population to grow.

## **Targeted Studies**

A goal of targeted studies initiated under the Plan will be to identify any factors that are limiting population expansion of Tiburon Indian paintbrush. For example, land use patterns around known populations could be reducing habitat quality and restricting population expansion. If these land use patterns are correlated with population isolation, or if any other factors are shown to be limiting population growth, then management actions will be prescribed and implemented to change those land use patterns or factors to promote natural population expansion. Monitoring the response of plant populations to those actions will inform future management of these two very important sites.

An additional management action that is prescribed for Tiburon Indian paintbrush is experimental grazing exclusion. When such projects are implemented, appropriate monitoring protocols will be developed to study the population response.

## **Monitor Additional Threats**

The Kirby Canyon Butterfly Trust is currently assessing the effectiveness of excluding feral pigs from areas where known Tiburon Indian paintbrush populations exist. Feral pig rooting is considered a threat to plant populations, although it is also possible that such disturbance could be beneficial if properly managed. It is uncertain if replicated experiments will be possible to determine the most effective balance of disturbance from feral pigs because Tiburon Indian paintbrush population numbers are low. However, monitoring will measure population response to pig-removal efforts, and decisions about long-term exclusion of pigs from these sites will be based on those results.

Rapid changes in grassland habitat, such as fire, could have an effect on grassland species. Tiburon Indian paintbrush populations will be monitored before and after fires, should they occur. By monitoring the post-fire recovery of grassland habitat, which might include variables such as percentage of

reestablished native versus nonnative grassland, an assessment can be made about overall quality of habitat and whether permanent changes in grassland habitat will affect the persistence of Tiburon Indian paintbrush populations.

## **Coyote Ceanothus (Group 1)**

### **Document and Monitor Species Status**

The location and geographic extent of the three known occurrences of coyote ceanothus are well documented within the study area from field observations and air photos (it is the only covered species visible on air photos due to its distinctive color signature). However, data on occurrence size and demography are limited because portions of all three occurrences occur on private land. These three occurrences will be added to the Reserve System and baseline occurrence assessments will be made at that time. The response of each occurrence to management under this Plan will be measured against those baseline occurrence levels. Survey protocols for the species will need to be developed. Occurrence size surveys may include complete counts for small occurrences or statistical sampling and analysis for larger occurrences. All surveys that are conducted will be coordinated with any ongoing survey efforts (e.g., Santa Clara Valley Water District 2005).

Coyote ceanothus status will be monitored over time in relation to baseline occurrence sizes; baseline data will serve as the standard against which future changes are measured. Monitoring will evaluate changes over time and the response of plant occurrences to management activities. Monitoring will include data on occurrence size, numbers and location; age classes; seedling survival and health and vigor of occurrences. Location data will be collected by GPS and documented in GIS layers. Monitoring surveys will occur at frequency intervals described above in the introduction to Section 7.3.3 *Species-Level Actions*. In addition to annual monitoring, monitoring will always be conducted following events that may have strong effects on occurrence size and condition (e.g., fire, severe weather, human impact). Monitoring methods will be based on up-to-date, repeatable methods of tracking occurrence status over time.

### **Evaluate Covered Species Response to Habitat Enhancement**

There may be little grazing pressure on any of the three occurrences due to exclusion fencing, although native herbivores such as deer may browse seedlings. However, if different grazing regimes or other management techniques are employed in these areas, the effects of those techniques on each occurrence will be determined by conducting appropriate monitoring surveys. These surveys will include quantifying how these management regimes change natural communities that surround known occurrences. Recruitment of seedlings will be tracked to determine which management techniques are most effective at increasing occurrence levels.

## Targeted Studies

A goal of monitoring under the Plan is to identify factors that limit coyote ceanothus expansion. Management actions will then be prescribed to remove or reduce those limitations; this process will be adaptively managed through follow-up occurrence surveys.

New occurrences of Coyote ceanothus will be created using field experiments to investigate suitable propagation or planting techniques and determine appropriate seed-sampling techniques from existing occurrences. These targeted studies will be experimental, and the impact that they have on known occurrences will be monitored (i.e., the effects of using existing occurrences as a seed stock for new occurrences).

All created occurrences will be monitored with appropriate protocols to measure establishment success and determine whether this technique is a viable management option. The outcomes of these targeted studies will be used in adaptive management decisions and to inform conservation actions for this species.

Additional targeted studies will be conducted to examine the effects of prescribed burns on coyote ceanothus occurrences. In the past, observers have noted increased recruitment following fires. The goal of experimental burning under this Plan is to determine the importance of fire on plant regeneration and to identify the most effective fire regime for increasing the size of occurrences. Monitoring occurrence response to experimental burning will inform future management action for this species.

## Monitor Additional Threats

If any natural fires occur in areas of coyote ceanothus occurrences, then the occurrences will be monitored to study how the occurrence and species respond. Specific protocols will be developed in the context of the fire and how it has affected the plant occurrence.

## Santa Clara Valley Dudleya (Group 1)

### Document and Monitor Species Status

Although many occurrences of Santa Clara Valley dudleya are well documented in the study area, baseline occurrence surveys will be conducted on modeled habitat in the Reserve System to quantify or estimate the number of individuals in known occurrences and to determine if undiscovered occurrences occur on the property. Because this perennial species is readily identifiable at all times of year, surveys can be conducted at any time. Many of the known occurrences occur on private lands. If these areas are added to the Reserve System, baseline occurrence assessments will be made at that time so that the response of each

occurrence to management can be measured against those baseline occurrence levels. Baseline monitoring is currently being conducted for this species in permanent plots on Coyote Ridge on the UTC parcel (Arcadis 2008).

One key question that will be addressed early in monitoring implementation is the maximum spacing distance for individuals within the same occurrence. Santa Clara Valley dudleya individuals are patchily distributed, clustering on discrete rock outcrops. It is likely that plant interactions decrease with increasing distance from rock-outcrop patches. Occurrences are not likely to be discrete entities but rather a continuum of sub-occurrences. However, an operational “boundary” needs to be defined to delineate occurrences for monitoring and management purposes.

Monitoring will evaluate changes over time and the response of plant occurrences to management activities. Monitoring will include data on occurrence size, numbers and location; age classes; seedling survival and health and vigor of occurrences. Location data will be collected by GPS and documented in GIS layers. In addition to annual monitoring, monitoring will always be conducted following events that may have strong effects on occurrence size and condition (e.g., fire, severe weather, human impact). Monitoring methods will be based on up-to-date repeatable methods of tracking occurrence status over time.

## **Evaluate Covered Species Response to Habitat Enhancement**

The effect of grazing regimes or other management techniques on each occurrence of Santa Clara Valley dudleya will be monitored by conducting surveys according to the same protocols established in baseline surveys. Monitoring studies may also include protocols to quantify how management techniques affect the serpentine grassland habitat that surrounds known occurrence or to assess if these techniques have an effect on Santa Clara Valley dudleya individuals or occurrence.

## **Targeted Studies**

A goal of monitoring under the Plan is to identify factors that limit the expansion of Santa Clara Valley dudleya occurrences. Management actions will then be prescribed to remove or reduce those limitations; this process will be adaptively managed through follow-up occurrence surveys.

## **Monitor Additional Threats**

Grazing by native species (e.g., Tule elk) and livestock is thought to be a threat to Santa Clara Valley dudleya, however the actual threat posed by grazing has not been documented. As serpentine grassland management is implemented, a

replicated experiment design will be used to determine to what extent and by what mechanism(s) livestock grazing affects known occurrences. These studies will also aim to determine the level of protection from grazers that this species needs to remain viable. Such studies will include a grazing exclusion component.

Rapid changes in grassland habitat, such as natural or prescribed burns, could have an effect on grassland species such as this. Santa Clara Valley dudleya occurrences will be monitored before and after fires occur. By monitoring the recovery period for grassland habitat, as well as other variables (e.g., percent native versus nonnative grassland that reestablishes), an assessment can be made about overall habitat quality and whether permanent changes in grassland habitat will affect the persistence of these occurrences.

## **Metcalf Canyon Jewelflower (Group 1)**

### **Document and Monitor Species Status**

Baseline occurrence surveys will be conducted on modeled habitats in the Reserve System to quantify or estimate the number of individuals in known occurrences and to determine if undiscovered occurrences occur on the property. Most of the known occurrences of Metcalf Canyon jewelflower occur on private lands. If these areas are added to the Reserve System, then baseline occurrence assessments will be made at the time of acquisition to assess occurrence levels. Thereafter, the response of each occurrence to management can be measured against those baseline levels. Baseline monitoring is currently being conducted for this species in permanent plots on Coyote Ridge on the UTC parcel (Arcadis 2008).

Monitoring of Metcalf Canyon jewelflower will occur during its flowering period, between April and July, and surveys will occur only when the plants are actually flowering in order to assure recognition. Monitoring will evaluate changes over time and the response of plant occurrences to management activities. Monitoring will include data on occurrence size, numbers and location; age classes; seedling survival and health and vigor of occurrences. Location data will be collected by GPS and documented in GIS layers. In addition to annual monitoring, monitoring will always be conducted following events that may have strong effects on occurrence size and condition (e.g., fire, severe weather, human impact). Monitoring methods will be based on up-to-date repeatable methods of tracking occurrence status over time.

### **Evaluate Covered Species Response to Habitat Enhancement**

The effect of grazing regimes or other management techniques on each occurrence of Metcalf Canyon jewelflower will be monitored by conducting surveys according to the same protocols established in baseline surveys.

Monitoring studies may also include protocols to quantify how management techniques affect the serpentine rock outcrops on which the species grows and/or to assess if these techniques have an effect Metcalf Canyon jewelflower individuals or occurrences.

## Targeted Studies

A goal of monitoring under the Plan is to develop studies that identify factors limiting the expansion of Metcalf Canyon jewelflower occurrences. Management actions will then be prescribed to remove or reduce those limitations; this process will be adaptively managed through follow-up surveys.

New occurrences of Metcalf Canyon jewelflower will be created using field experiments to investigate suitable propagation or planting techniques and determine appropriate seed-sampling techniques from existing occurrences. These targeted studies will be experimental, and the impact that they have on known occurrences will be monitored (i.e., the effects of using existing occurrences as a seed stock for new occurrences). The micro-habitat of this species is serpentine rock outcrops, particularly steeply cut rock faces such as those found in roadcuts, and this habitat may be experimentally created and seeded.

All created occurrences will be monitored with appropriate protocols to measure establishment success to determine whether this technique is a viable management option. The outcomes of these targeted studies will be used in adaptive management decisions and to inform conservation actions for this species.

Metcalf Canyon jewelflower is known to interbreed with its close relative, also a covered plant species—most beautiful jewelflower. There is concern that Metcalf Canyon jewelflower could eventually lose its distinct genetic integrity (Weiss and Wright 2005). Targeted studies will be undertaken to monitor this introgression and develop protocols to protect the genetic integrity of both species.

## Monitor Additional Threats

Grazing by native species and livestock may be a threat to Metcalf Canyon jewelflower. As serpentine grassland management is implemented, a replicated experimental design will be used to determine how livestock grazing affects known occurrences. These studies will also aim to determine the level of protection from grazers that this species needs to remain viable. Such studies will include a grazing-exclusion component.

Rapid changes in grassland habitat, such as natural or prescribed burns, could have an effect on Metcalf Canyon jewelflower since it generally grows in outcrops and roadcuts within a larger grassland matrix. Occurrences will be

monitored before and after prescribed burns, and after any natural fires. By monitoring the recovery period for grassland habitat, as well as other variables (e.g., percent native versus nonnative grassland that reestablishes), an assessment can be made about overall habitat quality and whether permanent changes in grassland habitat will affect the persistence of these occurrences.

## **Foothill Yellow-Legged Frog (Group 2)**

### **Document and Monitor Species Status**

Foothill yellow-legged frogs can be observed year-round in perennial streams. Observing adult foothill yellow-legged frogs is difficult, but possible. Surveys could be conducted throughout the breeding period (April–July), though the probability of detection is generally higher June–July.

During the breeding season, adults, juveniles, and tadpoles could be present in suitable streams, offering the greatest opportunity for detection. Surveys for adults will only be used to determine population levels if multiple surveys are conducted at a given site, all life stages have been counted, and survey coverage is near 100%. Otherwise, these visual detection surveys will only serve to determine presence/absence of the species along a given stream reach.

In most cases, the reproductive output of the population will be measured by counting egg masses in potential breeding habitat. The number of egg masses will be used to determine the relative number of breeding females in a given reach, as well as estimates of overall population health. Observing foothill yellow-legged frog adults or juveniles is difficult and could prove an inadequate method to determining relative population levels along a stream reach. However, all incidental sitings of adults, juveniles, or larvae will be recorded during each egg mass survey. Surveys for foothill yellow-legged frog egg masses will be conducted in known or assumed habitat both within the Reserve System and along stream courses that are outside of the Reserve System but where access has been granted to one of the Implementing Partners. Surveys will be conducted using the best available protocol for this species (e.g., Seldenrich and Pool 2002).

Foothill yellow-legged frogs typically lay most of their eggs during April (Bobzien and DiDonato 2007). This generally coincides with the end of the last high-water period in stream corridors. However, if large storm events occur during April, foothill yellow-legged frogs can delay egg laying to reduce mortality of egg masses from unseasonable high water (S. Bobzien pers. comm.). If there are unusually late storm events, surveys during that year will be shifted to maximize detection of egg masses.

Surveys of potential foothill yellow-legged frog habitat on land acquired for the Reserve System will be conducted according to the survey schedule outlined above. This information will be used to document baseline levels for population monitoring during the permit term and beyond. The baseline surveys will document the characteristics listed below.



- Stream reaches occupied by foothill yellow-legged frog adults.
- Unoccupied breeding habitat with the potential to support breeding populations (typically upstream or downstream of occupied habitat).
- Assessment of riparian vegetation and stream substrate along occupied and unoccupied stream reaches.
- Presence of nonnative bullfrogs, crayfish, or nonnative, predatory fish species in occupied or unoccupied habitat.
- Presence of other factors (threats) seemingly affecting breeding success at a given location.

This information will be documented in GIS layers and used to prioritize areas for protection and enhancement/restoration. This process will be used to determine the potential for unoccupied breeding habitat to be enhanced or restored to support breeding adults in the future. It will also inform how proposed restoration or enhancement of riparian corridors and streams might affect foothill yellow-legged frog breeding sites.

Monitoring protocols will be developed to assist the Implementing Entity in demonstrating compliance with species occupancy requirements described in Chapter 5, Section 5.3.1, subheading *Acquisition of Modeled Habitat for Covered Species*.

## **Evaluate Covered Species Response to Flow Regulation**

Changes in flow downstream of dams could affect remnant populations of foothill yellow-legged frogs in the permit area. Flows could also change as a result of dewatering events described in Chapter 2 *Land Use and Covered Activities*. If yellow-legged frog populations are found in streams hydrologically affected by existing dams in the permit area, the Implementing Entity will monitor the effects of flow regulation on the species.

## **Evaluate Species Response to Enhancement and Restoration of Stream Habitat**

Stream reaches that are targeted for restoration or enhancement will be monitored to determine the response of breeding foothill yellow-legged frogs. The relative success of different techniques for maintaining or increasing foothill yellow-legged frog populations will be assessed to guide future management efforts. Enhancement or restoration of occupied breeding habitat will be monitored by determining changes in the number of egg masses detected during surveys to establish estimates of reproductive output. Surveys will be conducted at the frequencies discussed above.

Ideally, egg mass surveys will be conducted once a week during the peak egg-laying period (Bobzien and DiDonato 2007). Peak egg-laying periods within the

study area will be determined by surveying early in the known breeding period and ending the surveys at the end of the known breeding period or after no new egg masses have been observed, whichever comes last. Survey periods must be flexible to adjust for climate-induced impacts to egg-laying period (e.g., warm, low moisture winter may delay the egg mass laying in April and move it into May.) April has been noted as the peak egg-laying period for foothill yellow-legged frogs in nearby Alameda and Contra Costa Counties (Bobzien and DiDonato 2007). The overall reproductive output (i.e., number of egg masses) will be recorded during the survey period, and each egg mass will be recorded with a handheld GPS unit. This will allow for follow-up surveys of breeding sites in subsequent years.

Additional habitat enhancements, such as changes in flow regimes, could be implemented in streams that support foothill yellow-legged frog habitat. Monitoring how these changes affect habitat quality and different life stages of development will be important.

## **Evaluate Management of Riparian Corridors**

When enhancement or restoration activities are conducted in riparian areas, foothill yellow-legged frog populations will be monitored to determine how changes in riparian vegetation affect the local breeding population. That information will be used to inform future management actions along stream reaches that are occupied by foothill yellow-legged frogs. For example, if trees are removed to open up the canopy of a riparian corridor to promote growth in the understory for early successional songbird species, the response of the yellow-legged frog population along that reach would be of interest. Similarly, riparian restoration that promotes overstory vegetation and subsequently cools target reaches will be monitored for foothill yellow-legged frog response.

In some streams, alternate, off-stream water sources will be provided for livestock to discourage them from entering the stream. Where necessary, fencing will be installed to exclude livestock from particularly sensitive reaches. The foothill yellow-legged frog population and reproductive output will be monitored and compared to baseline conditions to determine if this method affects species response.

## **Evaluate Response to Nonnative Plant and Animal Control**

During baseline surveys, a description of breeding habitat that is occupied by bullfrogs, crayfish, and predatory fish species will also be completed. These data will inform management actions within the Reserve System. Subsequent surveys for bullfrogs and predatory fish will be conducted to determine the effectiveness of eradication efforts. This will also allow for an assessment of the response of native amphibian populations to nonnative species eradication.

In addition, the removal of nonnative vegetation in riparian areas and reseeded with native vegetation may temporarily or permanently change the habitat adjacent to that used by foothill yellow-legged frogs. Population size will be estimated and reproductive output (i.e., number of egg masses) will be monitored along reaches that are restored or enhanced to determine if there are short-term (less than 5 years) or long-term (more than 5 years) effects. The results of this monitoring will inform vegetation management along corridors adjacent to foothill yellow-legged frog habitat.

## **Monitor Additional Threats**

Monitoring will be conducted for diseases and the efficacy of disease control including chytrid fungus and any other harmful diseases that are discovered in the Reserve System during Plan implementation. Spread of these diseases becomes a concern when biologists access more than one breeding site in a short period of time. Biologists will utilize accepted antiseptic protocols during all aquatic surveys work to minimize the potential for cross-contamination.

## **Western Pond Turtle (Group 2)**

### **Document and Monitor Species Status**

Surveys of potential western pond turtle habitat in land acquired for the Reserve System will be conducted to select sites for monitoring and document baseline population levels. These sites will then be revisited and the population levels measured against the baseline to determine the effectiveness of management actions. Baseline surveys will entail an assessment of the characteristics listed below.

- Stream reaches, ponds, wetlands, or reservoirs occupied by western pond turtle adults.
- Unoccupied aquatic habitat with the potential to support populations (typically adjacent to occupied habitat).
- Basking sites that could be monitored repeatedly.
- Adjacent upland overwintering habitat for stream turtles (turtles using ponds remain in the water in winter).
- Adjacent upland nesting habitat, particularly in areas where nesting has been documented in the past.
- Presence of other factors (threats) seemingly affecting breeding success at a given location (e.g., adjacent land use).
- Observations on size structure of the population to ensure that young turtles are present and that successful reproduction is occurring.

This information will be documented in GIS layers and used to prioritize areas for enhancement and restoration. This process will be used to determine the

potential for unoccupied breeding habitat to be enhanced or restored to support western pond turtles in the future. It will also help predict how proposed restoration or enhancement of aquatic habitat and adjacent uplands might affect western pond turtle nest sites.

Western pond turtles can be observed year-round in perennial streams, ponds, and wetlands and on the fringes of reservoirs. Surveys will be conducted at times as early as March, in conjunction with surveys for stream populations of California red-legged frogs, but the highest probability of detection to determine presence of the species is during the summer months when individuals can be counted while basking during the middle of the day. Repeated annual surveys of basking sites will be used as an index for overall population numbers. This method will likely be more effective in ponds and wetlands, where aquatic habitat is well defined, than in streams or lakes where individuals are able to move greater distances through the water.

In many cases, it could be beneficial to install artificial basking sites in ponds or wetlands that would be monitored every year. This would facilitate monitoring in areas where there are no basking sites or where sites are submerged during high-water periods. In streams and along reservoir margins, existing information on species distribution and baseline survey data of suitable basking sites will provide an inventory of future survey sites. Once identified, these basking sites will be monitored at the frequencies described above in the introduction to Section 7.3.3 *Species-Level Actions* to determine the number of individuals present. These results will be used to determine the population level in the area and will allow for some analysis of population response to management actions.

Monitoring protocols will be developed to assist the Implementing Entity in demonstrating compliance with species occupancy requirements described in Chapter 5, Section 5.3.1, subheading *Acquisition of Modeled Habitat for Covered Species*.

## **Evaluate Covered Species Response to Flow Regulation**

Flows could also change as a result of dewatering events described in Chapter 2 *Land Use and Covered Activities*. If western pond turtle populations are found in streams hydrologically affected by existing dams in the permit area, the Implementing Entity will monitor the effects of flow regulation on the species. Monitoring how these changes affect habitat quality and different life stages of development will be important.

## **Evaluate Species Response to Enhancement and Restoration of Aquatic Habitat**

Stream reaches, ponds, and wetlands that are targeted for restoration or enhancement will be monitored to determine the response of western pond turtle populations to those activities. The relative success of different techniques for

maintaining or increasing western pond turtle populations will be assessed to guide future management efforts. Enhancement or restoration of occupied habitat will be monitored by determining changes in the average number of individuals observed during basking site surveys. This method will only be useful at monitoring long-term trends, but it will give some sense of the population response to the change in habitat.

In areas where nesting is known to occur, the number of nesting attempts or the success rate of nests will be monitored to determine how site-specific management prescription are affecting turtles during the nesting period. The opportunities to conduct this type of monitoring may be limited due to the number of known nesting areas and the difficult nature of monitoring nesting turtles without disturbing important nesting areas. The Implementing Entity will determine the best approach for monitoring western pond turtle once reserves are acquired and reserve unit management plans are being developed. Trapping or observations can provide information on the relative abundance of young (small) turtles as an index to reproductive success.

In some streams, alternate, off-stream water sources will be provided for livestock to discourage them from entering the stream. Some ponds will be partially fenced to exclude grazing and promote growth of emergent vegetation. Western pond turtle populations will be monitored and compared to baseline conditions to determine if these methods improve habitat quality and increase numbers of turtles.

Additional habitat enhancements, such as changes in flow regimes, may be implemented in streams that support western pond turtle habitat. Monitoring by the Implementing Entity regarding how these flows affect habitat quality will be important. Changes to riverine systems to conditions that are more natural will inherently benefit western pond turtles in the study area.

## **Monitor Additional Threats**

Nesting sites and nest success are thought to be the limiting factor for this species in the study area. Identifying known or potential nest sites in the Reserve System and along target streams will provide valuable information that informs efforts to conserve the species. Studies have shown that while western pond turtle populations can seem relatively stable due to the presence of adults, there may be minimal recruitment of juveniles into the population (Reese 1996). Focusing on aquatic habitats is important, but extending that focus to include adjacent uplands, where nesting could occur, is critical to guaranteeing the long-term stability of the populations.

## Other Covered Plants (Group 2)

There are 6 other rare plant species covered by this Plan. Their monitoring actions will be comparable and are described below. These plant species include the following:

- Mount Hamilton thistle
- Fragrant fritillary
- Loma Prieta hoita
- Smooth lessingia
- Most beautiful jewelflower

## Document and Monitor Species Status

Baseline surveys will be conducted on parcels that are added to the Reserve System to determine or estimate the number of individuals in known occurrences of covered plants and whether undiscovered occurrences occur on the property. Surveys will be conducted at the appropriate blooming period for each species (see **Appendix D** for blooming periods). Survey protocols will be developed for each species. When feasible and efficient to do so, surveys for serpentine plants will be included with the above-described surveys for Bay checkerspot butterfly. Surveys may entail counts for small sub-occurrences or statistical sampling and analysis for larger occurrences. Baseline monitoring is currently being conducted for fragrant fritillary, most beautiful jewelflower, smooth lessingia, and Mount Hamilton thistle in permanent plots on Coyote Ridge on the UTC parcel (Arcadis 2008).

Species status will be monitored over time in relation to baseline occurrence sizes; baseline data will serve as the standard against which future changes are measured. Monitoring will evaluate changes over time and the response of plant occurrences to management activities. At a minimum, monitoring will include data on occurrence size, numbers and location; age classes; seedling survival; health and vigor of occurrences, threats, and adjacent land uses. Location data will be collected by GPS and documented in GIS layers.

For some species, it may be important to separate individuals into stages (e.g., seedlings, adults, reproductive adults) to assess occurrence dynamics. In addition to the specified monitoring, monitoring will always be conducted following events that may have strong effects on occurrence size and condition (e.g., fire, severe weather, human impact). Monitoring methods will be based on up-to-date repeatable methods of tracking occurrence status over time.

## Evaluate Species Response to Habitat Enhancement

Several land management actions will be implemented under this Plan. In many areas these management activities are already occurring. For example, grazing is

an important part of grassland management in the study area. However, the manner in which reserve lands are grazed may change as the result of prescriptive management outlined in reserve unit management plans. In some areas, grazing may be reduced in favor of other management techniques such as prescribed fire.

In all such cases the impact of changes in management on covered plant occurrences will be tracked through occurrence monitoring. Management at the natural community level will be informed by information that is gathered during species-specific monitoring. Monitoring will be designed to facilitate quantification of how these management regimes change the number of individuals in an occurrence and/or the total number of occurrences. Additional data that could be collected to inform management decisions include the recruitment of seedlings in covered plant occurrences and changes in the species richness of natural communities surrounding covered plant occurrences. Ultimately, the findings of these monitoring activities should determine which management techniques are most effective at increasing covered plant occurrence levels in the Reserve System.

## **Targeted Studies**

A goal of monitoring under the Plan is to identify factors that limit the expansions of covered plant occurrences. Management actions will then be prescribed to remove or reduce those limitations; this process will be adaptively managed through follow-up surveys.

For some species, targeted studies will be conducted to evaluate the efficacy of establishing new occurrences by transplanting individuals from known occurrences or by seed collection and propagation. These created occurrences will be monitored and their success, as well as any impact that transplantation or seed collection has on known occurrences, will be recorded and incorporated into adaptive management decisions. In addition, the success rate of establishing individuals in new locations will be tracked to determine if this is a viable management option. The outcomes of these studies will be used to inform conservation actions for these species.

The Plan also prescribes some management actions for specific species, such as conducting experimental grazing exclusion for a small suite of plants. In all cases of specific management action implementation, appropriate monitoring protocols will be developed and carried out.

## **Monitor Additional Threats**

While fire is likely necessary for the propagation of some species, the effect of fire on covered species is not well understood at this time. Accordingly, covered plant occurrences will be monitored after fires. By monitoring the recovery period for natural communities that burn, as well as other variables such as

percent native versus nonnative species that reestablish, an assessment can be made of overall habitat quality and whether permanent changes in available habitat will affect the persistence of covered plant occurrences.

Mt. Hamilton thistle may face threats from the release of biological control agents (e.g., insect herbivores) that target related invasive thistles. If such releases are conducted in the study area, occurrences of Mt. Hamilton thistle on the Reserve System need to be monitored closely to determine whether there are any adverse effects on this covered species. However, initial monitoring does not show a significant effect on recruitment from biocontrol agents (Hillman 2007).

Additional monitoring may be necessary for covered plants (e.g., Loma Prieta hoita) that may be susceptible to feral pig rooting or damage by other invasive species. Covered plant occurrences near recreational trails will be monitored periodically for trampling or illegal collecting.

## San Joaquin Kit Fox (Group 3)

### Document and Monitor Species Status

Although state and federally listed, the San Joaquin kit fox is included in Group 3 because the study area is not considered a critical component of the species' range. Monitoring for San Joaquin kit fox will be difficult due to the very low numbers of individuals in the study area (or their absence in many years) and also to their presence primarily on private property. While some monitoring for kit fox will be conducted, as described below, most monitoring for this species will be conducted at the natural community level. For example, monitoring of grasslands, described above in the introduction to Section 7.3.3 *Species-Level Actions* will reveal how grassland communities are responding to grassland management under this Plan. Facilitating a net increase in native grassland communities within the Reserve System will provide more and better habitat for kit fox by increasing the prey base. Further, monitoring the connectivity of habitats within the study area through study of other more abundant species with similar long-distance dispersal behavior (e.g., coyote, bobcat, badger) will ultimately determine if the goal of increased habitat connectivity for kit fox has been achieved.

The San Joaquin kit fox *Level B Strategy* of the *Recovery Plan for Upland Species of the San Joaquin* identified a number of research needs to refine viability models and land-use optimization model (U.S. Fish and Wildlife Service 1998). In accordance with these research needs, a baseline survey of potential den sites will be conducted for modeled San Joaquin kit fox habitat (**Appendix D**) in the Reserve System. Potential den sites will be assessed for occupancy, and a schedule for follow-up monitoring will be established. Further, to assess how San Joaquin kit fox and other terrestrial species move across SR 152 (the most prominent barrier within the modeled San Joaquin kit fox habitat), a combination of trail cameras or track boards will be used at assumed crossing locations (e.g., bridges, culverts) to quantify wildlife corridor use. A



methods testing study will be conducted to identify methods for quantifying use of crossings by native species.

## **Evaluate Species Response to Habitat Enhancement**

It is assumed that monitoring efforts aimed at quantifying grassland community enhancement and connectivity will be suitable to assess kit fox habitat quality. For example, if grassland enhancement efforts are deemed successful at increasing the amount of grassland and overall connectivity in the Reserve System, then those efforts will be similarly successful for grassland-dependent species such as San Joaquin kit fox. The density and distribution of California ground squirrels in the Reserve System will also be used as a proxy for habitat quality and quantity for San Joaquin kit fox within the modeled range of the species. Baseline surveys to establish the distribution and burrow density of California ground squirrels in the Reserve System will be conducted, and that information will be used to refine the habitat model. Changes in distribution of California ground squirrels in response to grassland management will be considered changes in habitat availability for San Joaquin kit fox in areas modeled as San Joaquin kit fox range.

The Implementing Entity will also monitor the success of conservation actions focusing on removing fences, roads, and/or small culverts to increase habitat linkage for the kit fox by tracking more common indicator species. Indicator species will also be monitored to track the efficacy of fencing installed to direct movement toward linkages that are created or enhanced through Plan implementation.

## **Monitor Additional Threats**

Additional threats within the study area include SR 152, which bisects potential San Joaquin kit fox habitat. Other terrestrial mammals will be examined to evaluate how this and other roadways might be affecting habitat connectivity in the study area, because kit fox numbers are likely too low to reveal meaningful trends. How and where species move across these barriers and how those movement patterns change in response to crossing enhancement or roadway modifications will be assessed.

In addition, predation of nonnative red fox on San Joaquin kit fox will be examined as a threat.

Rapid changes in grassland habitat, such as natural or prescribed burns, could have a temporary effect on prey availability and cover for San Joaquin kit fox. To determine how the prey base is affected, California ground squirrel colonies will be monitored before and after fires occur. By monitoring the recovery period for grassland habitat, including ecosystem variables such as size of the reestablished ground squirrel colony, an assessment can be made of overall

habitat quality and whether permanent changes in grassland habitat will affect the occurrence or persistence of a San Joaquin kit fox population.

## **Least Bell's Vireo (Group 3)**

### **Document and Monitor Species Status**

Although state and federally listed, least Bell's vireo is included in Group 3 because the study area is not considered a critical component of the species' range. Surveys of riparian woodland within the Reserve System will be conducted. Initially, the Implementing Entity will document any nesting activity in the study area. Because least Bell's vireos have only been documented twice in the recent past (once nesting, once foraging), other songbird species (e.g., song sparrow, common yellowthroat, Wilson's warbler, black headed grosbeak) that nest in the understory of riparian woodland could be used as indicators of habitat quality until least Bell's vireos are documented nesting in the study area. The focus areas for least Bell's vireo will initially be the species' modeled habitat (**Appendix D**) within the Reserve System and on other public lands. Surveys along these stream reaches will characterize the songbird communities (also part of natural community monitoring) and detect any least Bell's vireos present during the nesting season. Species status will be based on presence in the Reserve System and other public lands. Monitoring will also occur at least every 5 years in targeted sites outside the vireo's modeled habitat in the study area to determine if it is expanding (in particular, in the northern portion of the County). These surveys would be done by the Implementing Entity. Through adaptive management, the vireo model would change in the future due to new information.

Surveys will consist of either standard point count or area search methods (Ralph et al. 1993) depending on the terrain and size of the reach. The nesting season for riparian songbirds is typically April 15–July 31 in the study area. The period with the highest potential to detect breeding least Bell's vireo is mid- to late May (Santa Clara Valley Audubon Society 2005). Locations of all singing males will be recorded using a GPS receiver, as will any nests or other evidence of breeding activity. During baseline surveys, the species habitat model will be modified to reflect riparian habitat quality and actual nesting habitat within the Reserve System. Subsequent surveys will be focused on those areas to monitor changes in the population.

### **Evaluate Species Response to Habitat Enhancement and Restoration**

Additional surveys conducted by the Implementing Entity will be focused along riparian corridors where changes in land use or stream flow, or stream or riparian restoration activities, are expected to occur. For example, stream flow below the two south County reservoirs may be altered to improve habitat for covered aquatic species in Uvas Creek. Those alterations could change the riparian vegetation in Uvas or Llagas Creek, making it more or less suitable for breeding

least Bell's vireo. The actual effects will be determined by monitoring breeding least Bell's vireo populations along these stream reaches, should they be present or, in their absence, by monitoring breeding populations of other riparian understory obligates. Some modifications to land use, such as excluding livestock from stream corridors or stabilizing sources of sediment, could also change the vegetative structure along stream reaches. Monitoring least Bell's vireo and other riparian obligate songbird species will offer insight into how these changes affect the function of the riparian community.

In an extreme case, restoring engineered channels to a more natural condition will change the songbird community using the drainages during the nesting season. In such an instance it will be important to collect at least 1 year of baseline data along the engineered channel against which to compare the restored channel. However, few such scenarios are anticipated in potential least Bell's vireo habitat within the Reserve System (one example is Upper Llagas Creek within Morgan Hill).

## **Monitor Additional Threats**

Currently there are limited threats to least Bell's vireo within the study area because populations are absent or very low. It is assumed that the distribution of the local population will continue to expand northward as it has in the recent past. Once a least Bell's vireo population is established in the study area, there could be additional threats to nests and adults. Studies to determine nest success will be conducted annually once nesting is detected in the study area. In addition to documenting nest success, these studies will document reasons for nest failure and incidence of brown-headed cowbird parasitism (a major threat in established populations in southern California). The results of these studies will inform management decisions to increase nest success in the study area. Potential management actions are listed below.

- Brown-headed cowbird control program.
- Feral cat removal or relocation.
- Native and/or nonnative predator control (e.g., red fox, raccoon, skunk).
- Restricted public access to important breeding areas during the nesting season.

## **Tricolored Blackbird (Group 3)**

### **Document and Monitor Species Status**

All suitable freshwater wetland or pond habitat within the Reserve System will be surveyed in accordance with the survey schedule described in the introduction to Section 7.3.3 *Species-Level Actions* to document the baseline estimate of the population size within the Reserve System. Because tricolored blackbird populations are rare in the study area, other potential wetland sites on other

public lands will be surveyed to document the species in the region. Baseline information for the species will comprise the components listed below.

- Location of occupied wetlands.
- Estimate of number of birds in colony.
- Assessment of nesting habitat quantity and quality (e.g., percent of native and nonnative plants).
- Assessment of any additional nearby threats (e.g., heron rookeries, sources of noise or other disturbance).

This information will be documented in GIS layers and used to prioritize areas for protection and enhancement or restoration/creation.

Once baseline data are collected, monitoring for tricolored blackbird colonies will be conducted during the breeding season. The population size of established colonies will be monitored, as will unoccupied wetlands in the study area. Tricolored blackbirds typically nest from early April through early June. Because the probability of detecting nesting colonies is highest during May, surveys will be conducted during or near the month of May. It is suggested that each colony be visited twice during the breeding season, preferably 10–14 days apart, to determine a range of breeding individuals at the colony, by at least two observers on the same day. The mean number of birds estimated by the two observers can be used to determine the size of the breeding colony. During the survey, the colony will be observed through binoculars or a spotting scope at a distance that will not change the behavior of the nesting birds. These proposed monitoring guidelines will be revised if better methodologies based on the best available scientific information are developed during implementation.

Once baseline data have been collected on breeding habitat availability in the Reserve System and existing breeding colonies have been documented, that information will be used to determine breeding habitat connectivity within the study area. This will identify areas where “new” breeding habitat will be created or acquired to ensure habitat connectivity for this species. Information will be collected on where new colonies become established, and identifying the surrounding land use patterns (e.g., agriculture, irrigated pasture) that provide foraging habitat for breeding tricolored blackbirds. Areas where this relationship can be preserved or created within the Reserve System will be identified and evaluated for future restoration or creation of habitat.

## **Evaluate Species Response to Habitat Enhancement, Restoration, or Creation**

Enhanced or restored wetland areas and suitable created ponds will be monitored twice from April to June to determine if a tricolored blackbird nesting colony is present or, if one is already established, to document its current size. In wetlands or ponds where there are existing tricolored blackbird colonies, all enhancement or restoration activities will be conducted outside the nesting season. Following

those management actions, the tricolored blackbird colony size will be monitored to determine the population response to the management actions. In target areas where tricolored blackbirds were not observed prior to management actions, subsequent surveys will document whether new colonies establish in the area.

## Monitor Additional Threats

In instances where tricolored blackbirds are nesting in nonnative plants (e.g., Himalayan blackberry), there is the risk that nonnative species control could result in the loss of nesting habitat. Accordingly, the removal of nonnative plant species will be weighed against the loss of important nesting habitat for this species. There should be attempts to transition the nonnative habitat to native habitat that will also support nesting tricolored blackbirds. The colony response to those actions will be monitored and the result will inform future management prescriptions for colony sites with nonnative plants.

In general it is difficult to monitor nest success of tricolored blackbird because while nesting they are very susceptible to disturbance. Some information about colony success can be gained through annual monitoring of colony size, but this approach often fails to identify specific stressors. There are assumptions that some species (e.g., feral cats) can have a deleterious effect on colonies. For colonies that are near urban areas, feral cat removal programs could increase the success of nesting tricolored blackbirds. Similarly, robust populations of nonnative red foxes or even native skunks and raccoons can have significant impacts on nesting birds. In general, control programs will not address native species. However, targeted programs could be initiated in response to observations of individuals taking nests, eggs, or nestlings.

## 7.4 Data and Reporting

Proper data management, analysis, and reporting are critical to the success of the monitoring and adaptive management program. Data on monitoring methods, results, and analysis must be managed, stored, and made available to Implementing Entity staff, decision makers, scientific advisors, Wildlife Agencies, other interested government agencies including the Corps and Regional Boards, and other appropriate persons. A database and clear reporting procedure are also required for permit compliance. The requirements for database development, maintenance, and data reporting for monitoring are described in Chapter 8 *Plan Implementation*. The reporting requirements for monitoring include the following (also found in Chapter 8):

- A description of the landscape-, natural community-, and species-level monitoring undertaken during the reporting period and a summary of monitoring results, including species status and trends.
- A description of the adaptive management process utilized during the reporting period (e.g., consultation with science advisors, convening of the Independent Conservation Assessment Team).

- A summary of the recommendations or advice provided by the Wildlife Agencies, science advisors, and the Independent Conservation Assessment Team (if applicable) regarding adaptive management and monitoring.
- A summary of the monitoring program objectives, techniques, and protocols including monitoring locations, variables measured, sampling frequency, timing, and duration, analysis methods, and who performed the analyses.
- An assessment of the efficacy of the monitoring and research program and recommended changes to the program based on interpretation of monitoring results and research findings.
- An assessment of the efficacy of habitat restoration and creation methods in achieving performance objectives and recommended changes to improve the efficacy of the methods.
- A description of all Habitat Plan directed studies undertaken during the reporting period; a summary of study results; and a description of integration with monitoring, assessment, and compliance elements.
- An assessment of the appropriateness of performance indicators and objectives (see **Table 7-2** for examples) based on the results of effectiveness monitoring, and recommended changes to performance indicators and objectives.
- A description of any actions taken or expected regarding changed circumstances, including remedial actions.
- A description of any unforeseen circumstances that arose and responses taken.

**Table 7-1.** Schedule of Monitoring Tasks over the Permit Term

<b>Monitoring Type/ Phase</b>	<b>Summary Tasks</b>
<b>Years 0–5</b>	
Compliance	Set up tracking databases for impacts, acquisition, and restoration to land cover, and covered-plant populations.
Inventory	<p>Initiate inventories in the Reserve System.</p> <p>Assess landscape linkages using aerial photos and ground surveys and initiate data – collection program on wildlife movement.</p> <p>Submit reserve unit management plans for Wildlife Agencies review and approval within 5 years of the first acquisition for each reserve unit. Each plan will contain a detailed monitoring and adaptive management plan; including the development of indicators, monitoring protocols, and success criteria for management actions.</p> <p>Prioritize conservation actions within the Plan area.</p>
Targeted Studies	<p>Develop ecological models for Group 1 species.</p> <p>Initiate methods testing for key management actions (e.g., restoration).</p> <p>Prioritize and initiate pilot projects.</p> <p>Prioritize and initiate directed studies.</p>
Long-Term Monitoring	Develop experimental design for long-term management activities such as restoration and include as part of reserve unit management plans.
<b>Years 6–15</b>	
Compliance	Continue tracking impacts, acquisition and restoration. Ensure that mitigation stays ahead of impacts.
Inventory	Continue baseline inventories as sites are added to the Reserve System.
Targeted Studies	<p>Complete methods testing and pilot projects.</p> <p>Continue directed studies.</p>
Long-Term Monitoring	<p>Update GIS layer (every 5 years) and assess trends.</p> <p>Monitor covered-species response to management actions.</p> <p>Monitor covered species in accordance with the schedule developed in the Habitat Plan and the final detailed monitoring and adaptive management plan.</p> <p>Monitor success of restoration sites against success criteria.</p> <p>Review existing literature and scientific knowledge and make changes to monitoring and management based on new information.</p>
<b>Years 16–25</b>	
Compliance	Continue tracking impacts, acquisition, and restoration. Ensure that mitigation stays ahead of impacts.
Inventory	Continue baseline inventories as additional parcels are acquired.
Targeted Studies	Complete targeted studies.

Monitoring Type/ Phase	Summary Tasks
Long-Term Monitoring	Continue to assess status and trends of natural communities (aerial surveys) and species.
	Adapt management actions based on monitoring results of species response and success criteria for restoration and other management efforts.
	Continue to monitor covered species and adaptively manage species in response to monitoring results.
	Evaluate efficacy of monitoring protocols using results of pilot projects.
<b>Years 25+</b>	
Compliance	Finalize impact tracking. Maintain database of any active ongoing mitigation.
Inventory	Finalize baseline inventories of parcels acquired after Year 25.
Long-Term Monitoring	Continue to assess status and trends of natural communities (aerial surveys) and species.
	Based on 25 years of implementation, develop reduced monitoring protocols for target species and/or communities.
	Promote directed studies in the reserve system that benefit covered species and natural communities.



**Table 7-2.** Example Success Criteria for Monitoring Effectiveness of Selected Management Actions<sup>a</sup>

Management Action	Performance Period <sup>1</sup>	Example Success Criteria	
		Example Minimum Value <sup>3</sup>	Example Target Value <sup>4</sup>
Enhance Wetlands and Ponds: ponds and perennial wetlands	___ years following acquisition of ponds and perennial wetlands	<i>Nonnative predators:</i> <ul style="list-style-type: none"> <li>• Maintain ___% of all ponds and permanent wetlands free of nonnative fish (except mosquitofish) and bullfrogs in any given year</li> </ul>	<i>Nonnative predators:</i> <ul style="list-style-type: none"> <li>• Maintain all ponds and permanent wetlands free of nonnative fish (except mosquitofish) and bullfrogs annually</li> </ul>
		<i>Emergent vegetation cover-margins:</i> <ul style="list-style-type: none"> <li>• Maintain native emergent vegetation along at least ___% of pond and perennial wetland edges</li> </ul>	<i>Emergent vegetation cover-margins:</i> <ul style="list-style-type: none"> <li>• Maintain native emergent vegetation along at least ___% of pond and perennial wetland edges</li> </ul>
		<i>Emergent vegetation cover-pond surface:</i> <ul style="list-style-type: none"> <li>• For ponds designed to support tricolored blackbird breeding: Maintain native emergent vegetation over at least ___% of pond surface area</li> </ul>	<i>Emergent vegetation cover-pond surface:</i> <ul style="list-style-type: none"> <li>• For ponds designed to support tricolored blackbird breeding: Maintain native emergent vegetation over at least ___% of pond surface area</li> </ul>
		<i>Hydrology:</i> <ul style="list-style-type: none"> <li>• Maintain wetlands year-round in normal rainfall years<sup>6</sup></li> <li>• Maintain ponded surface water until October 1 in normal rainfall years<sup>6</sup></li> </ul>	<i>Hydrology:</i> <ul style="list-style-type: none"> <li>• Maintain wetlands year-round in dry rainfall years<sup>6</sup></li> <li>• Maintain ponded surface water until October 1 in normal rainfall years<sup>6</sup></li> </ul>
Pond creation	___ years following pond creation	<i>Extent created:</i> <ul style="list-style-type: none"> <li>• ___ acres<sup>5</sup></li> </ul>	<i>Extent created:</i> <ul style="list-style-type: none"> <li>• ___ acres<sup>5</sup></li> </ul>
		<i>Emergent vegetation cover:</i> <ul style="list-style-type: none"> <li>• ___% of ponds will support native emergent vegetation &gt; 5 feet tall (e.g., cattail or tules) over at least ___% of surface area (for Tricolored Blackbird)</li> <li>• ___% of ponds will support emergent vegetation over at least ___% but no more than ___% of the surface area (for California red-legged frog)</li> </ul>	<i>Emergent vegetation cover:</i> <ul style="list-style-type: none"> <li>• ___% of ponds will support native emergent vegetation &gt; 5 feet tall (e.g., cattail or tules) over at least ___% of surface area (for Tricolored Blackbird)</li> <li>• ___% of ponds will support emergent vegetation over at least 30% but no more than ___% of the surface area (for California red-legged frog)</li> </ul>

Table 7-2. Continued

Management Action	Performance Period <sup>1</sup>	Example Success Criteria	
		Example Minimum Value <sup>3</sup>	Example Target Value <sup>4</sup>
		<i>% emergent vegetation cover-margins:</i> <ul style="list-style-type: none"> <li>• Maintain native emergent vegetation along at least __% of each pond margin</li> </ul>	<i>% emergent vegetation cover-margins:</i> <ul style="list-style-type: none"> <li>• Maintain native emergent vegetation along at least __% of each pond margin</li> </ul>
		<i>Nonnative predators:</i> <ul style="list-style-type: none"> <li>• Maintain __% of all ponds free of nonnative fish (except mosquitofish) and bullfrogs in any given year</li> </ul>	<i>Nonnative predators:</i> <ul style="list-style-type: none"> <li>• Maintain all ponds free of nonnative fish (except mosquitofish) and bullfrogs annually</li> </ul>
Enhance Grassland	__ years following implementation of preserve-wide management of grasslands (and after pilot study complete)	<i>% native forb cover:</i> <ul style="list-style-type: none"> <li>• Demonstrate an upward trend in __% native forb cover relative to existing conditions</li> </ul>	<i>% native forb cover:</i> <ul style="list-style-type: none"> <li>• Increase native forb cover by __% relative to condition at time of acquisition</li> </ul>
		<i>% native grass cover:</i> <ul style="list-style-type: none"> <li>• Demonstrate an upward trend in % native grass cover (annual or perennial) relative to condition at time of acquisition</li> </ul>	<i>% native grass cover:</i> <ul style="list-style-type: none"> <li>• Increase native grass cover by __% relative to condition at time of acquisition</li> </ul>
		<i>Native plant diversity:</i> <ul style="list-style-type: none"> <li>• Demonstrate an upward trend in native plant diversity</li> </ul>	<i>Native plant diversity:</i> <ul style="list-style-type: none"> <li>• Demonstrate an upward trend in native plant diversity</li> </ul>
Increase Natural Burrow Availability and Prey Base in Grasslands	__ years following implementation of measure	<i>Abundance of burrows:</i> <ul style="list-style-type: none"> <li>• Demonstrate and upward trend in burrow density and distribution within the Reserve System</li> </ul>	<i>Abundance of burrows:</i> <ul style="list-style-type: none"> <li>• Increase the density of burrows by __% and total acreage of burrow complexes by __% within the Reserve System</li> </ul>
Enhance Oak Woodland	Implement measures to increase oak tree establishment and densities within __ years of detecting a decline in canopy cover	<i>Absolute oak tree canopy cover:</i> <ul style="list-style-type: none"> <li>• Maintain the existing __% absolute oak tree canopy cover in oak woodlands on Reserve lands</li> </ul>	<i>Absolute oak tree canopy cover:</i> <ul style="list-style-type: none"> <li>• Maintain the existing __% absolute oak tree canopy cover in oak savanna and woodlands on Reserve lands</li> </ul>

Table 7-2. Continued

Management Action	Performance Period <sup>1</sup>	Example Success Criteria	
		Example Minimum Value <sup>3</sup>	Example Target Value <sup>4</sup>
Restore Valley Oak Woodland	___ years following initial plantings of oak trees	<i>Extent restored:</i> • ___ acres <sup>5</sup>	<i>Extent restored:</i> • ___ acres <sup>5</sup>
		<i>% oak-tree canopy cover:</i> ___% tree canopy cover equal to or up to ___% greater than the percent canopy cover in valley oak stands removed by covered activities	<i>% oak- tree canopy cover:</i> ___% tree canopy cover equal to or up to ___% greater than the percent canopy cover in valley oak woodlands removed by covered activities
	___ years following initial plantings of oak trees	<i>Understory native plant cover:</i> • Develop an understory with native plant cover within ___% of existing conditions	<i>Understory native plant cover:</i> • Develop an understory with native plant cover equal to or greater than that of existing conditions
		<i>Understory native plant diversity:</i> • Develop an understory with native plant diversity at least ___% of existing conditions	<i>Understory native plant diversity:</i> • Develop an understory with native plant diversity equal to or greater than existing conditions
Enhance Chaparral and Northern Coastal Scrub	___ years following initial treatments	<i>Canopy gaps:</i> • Develop a gap frequency of ___% in stands of chaparral and northern coastal scrub	<i>Canopy gaps:</i> • Develop a gap frequency of ___% in stands of chaparral and northern coastal scrub
		<i>Chaparral plant regeneration:</i> • Demonstrate a steady or upward trend in native chaparral and northern coastal species numbers and/or density	<i>Chaparral plant regeneration:</i> • Increase the existing relative native chaparral and northern coastal species numbers and/or density (where appropriate) by at least ___%
Enhance Conifer Woodlands	___ years following initial treatments	<i>Species density:</i> • Maintain the existing species density	<i>Species density:</i> • Develop a species density of ___%
		<i>Species composition:</i> • Maintain the existing native species composition	<i>Species composition:</i> • Maintain the existing native species composition
		<i>Species regeneration:</i> • Demonstrate the existing species composition is maintained post-treatment	<i>Species regeneration:</i> • Demonstrate the existing species composition is maintained post-treatment

Table 7-2. Continued

Management Action	Performance Period <sup>1</sup>	Example Success Criteria	
		Example Minimum Value <sup>3</sup>	Example Target Value <sup>4</sup>
Enhance Riparian Woodland/Scrub	___ years following initial treatments	<i>Relative native tree canopy cover:</i> • Demonstrate an upward trend in native plant diversity	<i>Relative native tree canopy cover:</i> • Increase the existing relative native tree canopy cover by at least ___%
		<i>Relative native shrub canopy cover:</i> • Demonstrate an upward trend in native plant diversity	<i>Relative native shrub canopy cover:</i> • Increase the existing relative native shrub canopy cover by at least ___%
Restore Streams and Riparian Woodland/Scrub to Compensate for Habitat Loss and to Increase Biodiversity	___ years following restoration planting	<i>Extent restored:</i> • ___ acres <sup>5</sup>	<i>Extent restored:</i> • ___ acres <sup>5</sup>
		<i>Relative native tree canopy cover:</i> • Establish a relative native tree canopy cover of at least ___%	<i>Relative native tree canopy cover:</i> • Establish a relative native tree canopy cover of at least ___%
		<i>Relative native shrub canopy cover:</i> • Establish a relative native shrub canopy cover of at least ___%	<i>Relative native shrub canopy cover:</i> • Establish a relative native shrub canopy cover of at least ___ acres

## Notes:

<sup>a</sup> This table provides a framework for evaluating the success of certain conservation measures. The Implementing Entity will develop values for assessing success during the Inventory and Targeted Studies phases of implementation

<sup>1</sup> The estimated period following enhancement/creation/restoration of a natural community at a site during which performance standards should be achieved.

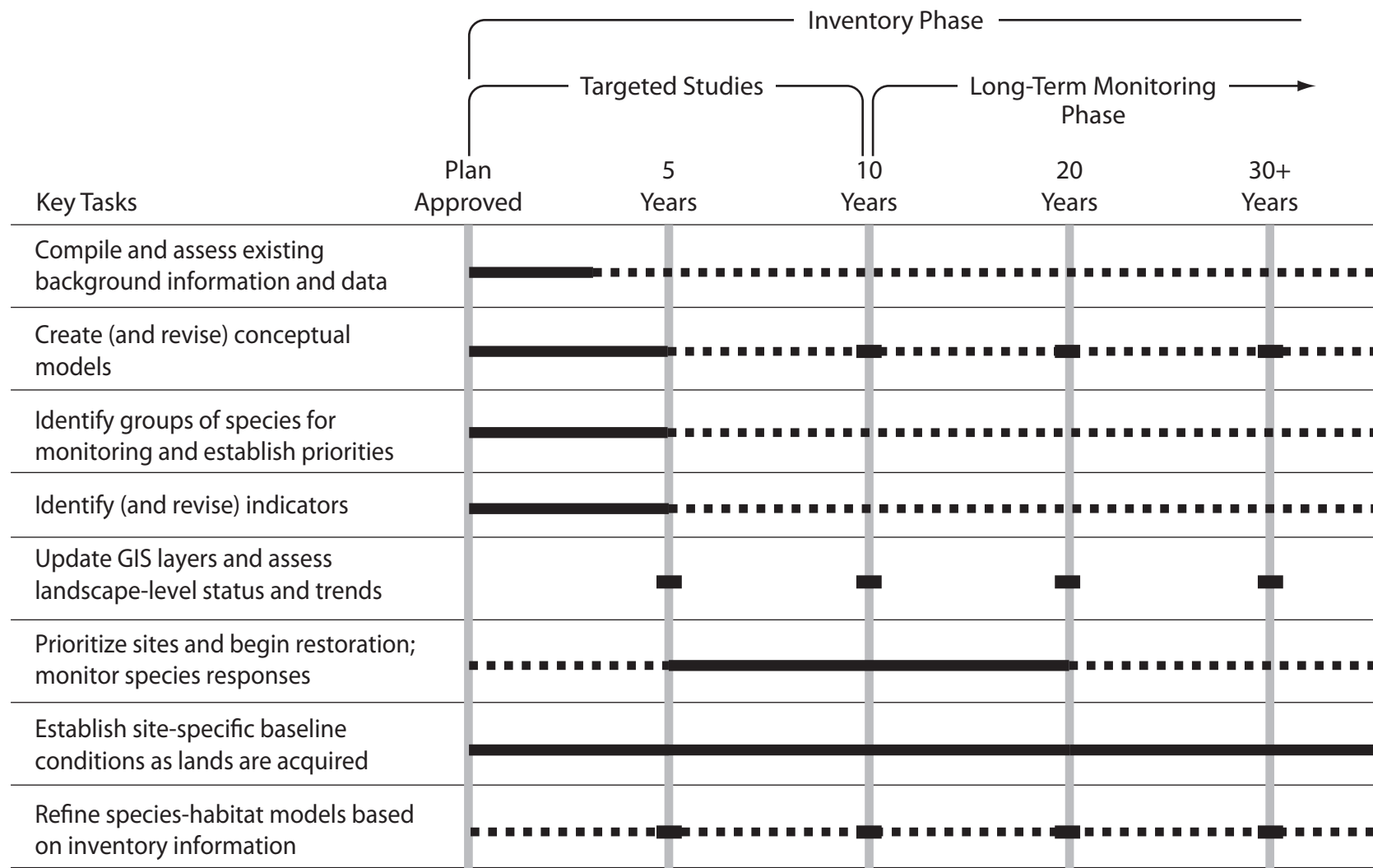
<sup>2</sup> Success criteria are shown in italics.

<sup>3</sup> The example minimum value is the minimum measured value for each success criterion that must be achieved during the performance period.

<sup>4</sup> The example target value represents the optimal desired value for each performance indicator and the design and management objectives for enhanced/created/restored natural communities. If performance objectives are not achieved, adaptive management actions may be triggered.

<sup>5</sup> Acres restored are estimates based on the impact analysis. Actual restoration performance standard/target may vary depending on actual field-verified impacts.

<sup>6</sup> Normal rainfall years are defined as within 1 standard deviation of the annual average rainfall as measured at the California Irrigation Management Information System (CIMIS) \_\_\_ rain gauge over the hydrologic record of the gauge (October–September). Dry years are defined as less than 1 standard deviation from the annual mean.

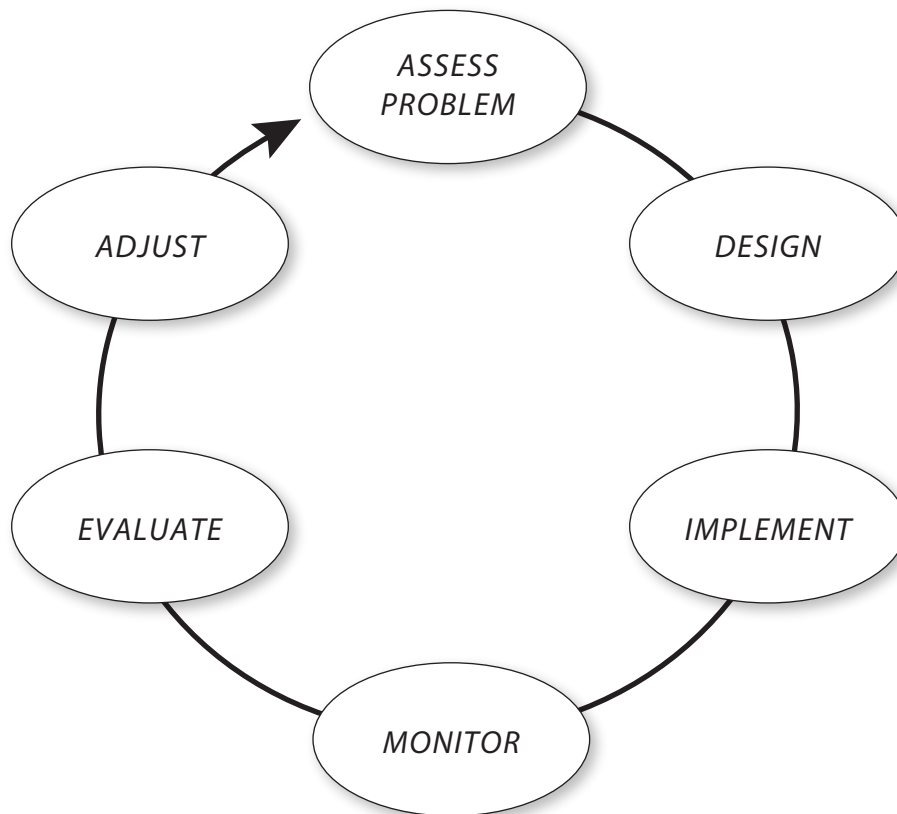


Note: Density of line indicates intensity of work.

Adapted from Atkinson et al. 2004.

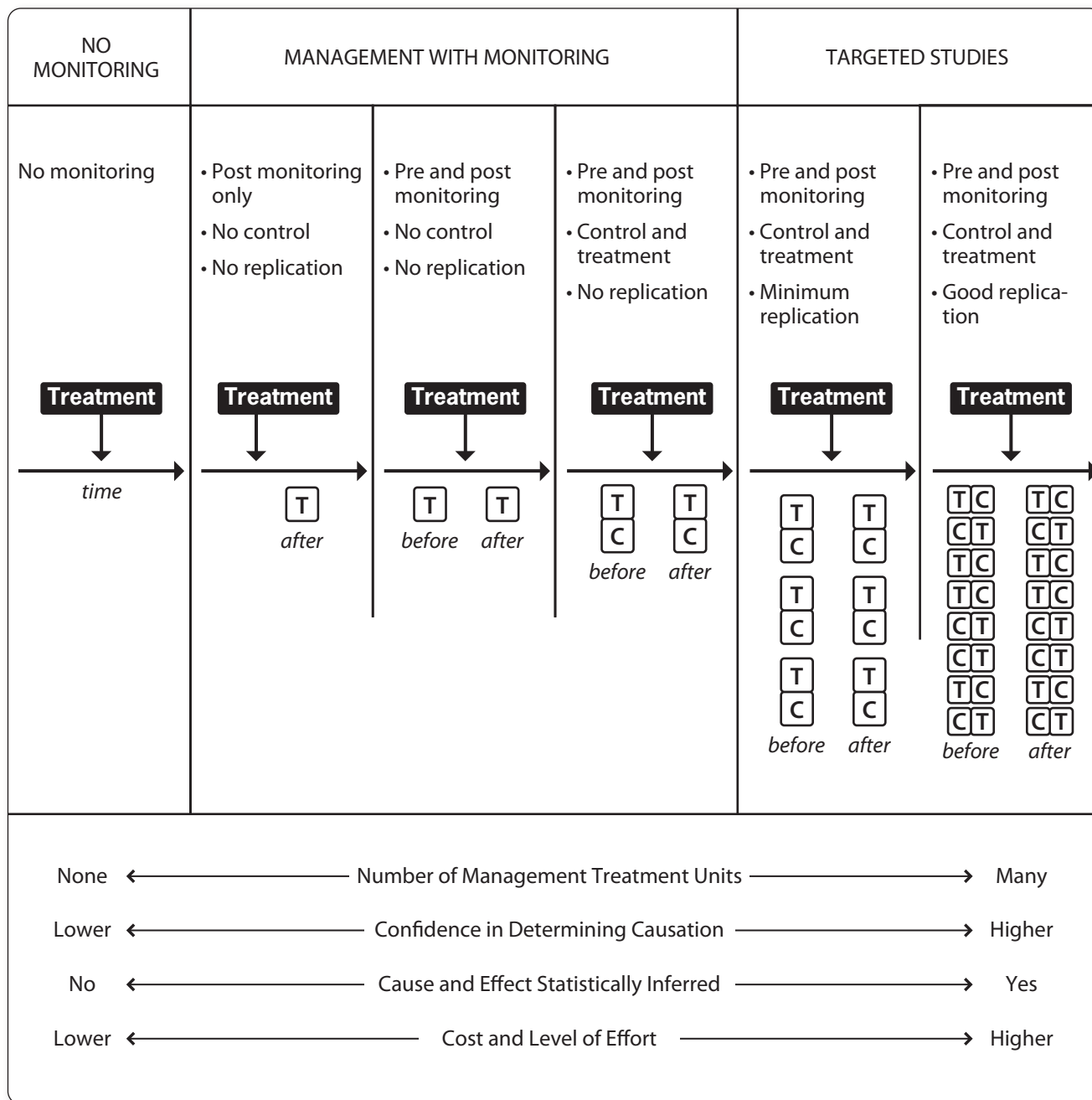
## *Adaptive Management Process*

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Adapted from William et al. 2007.

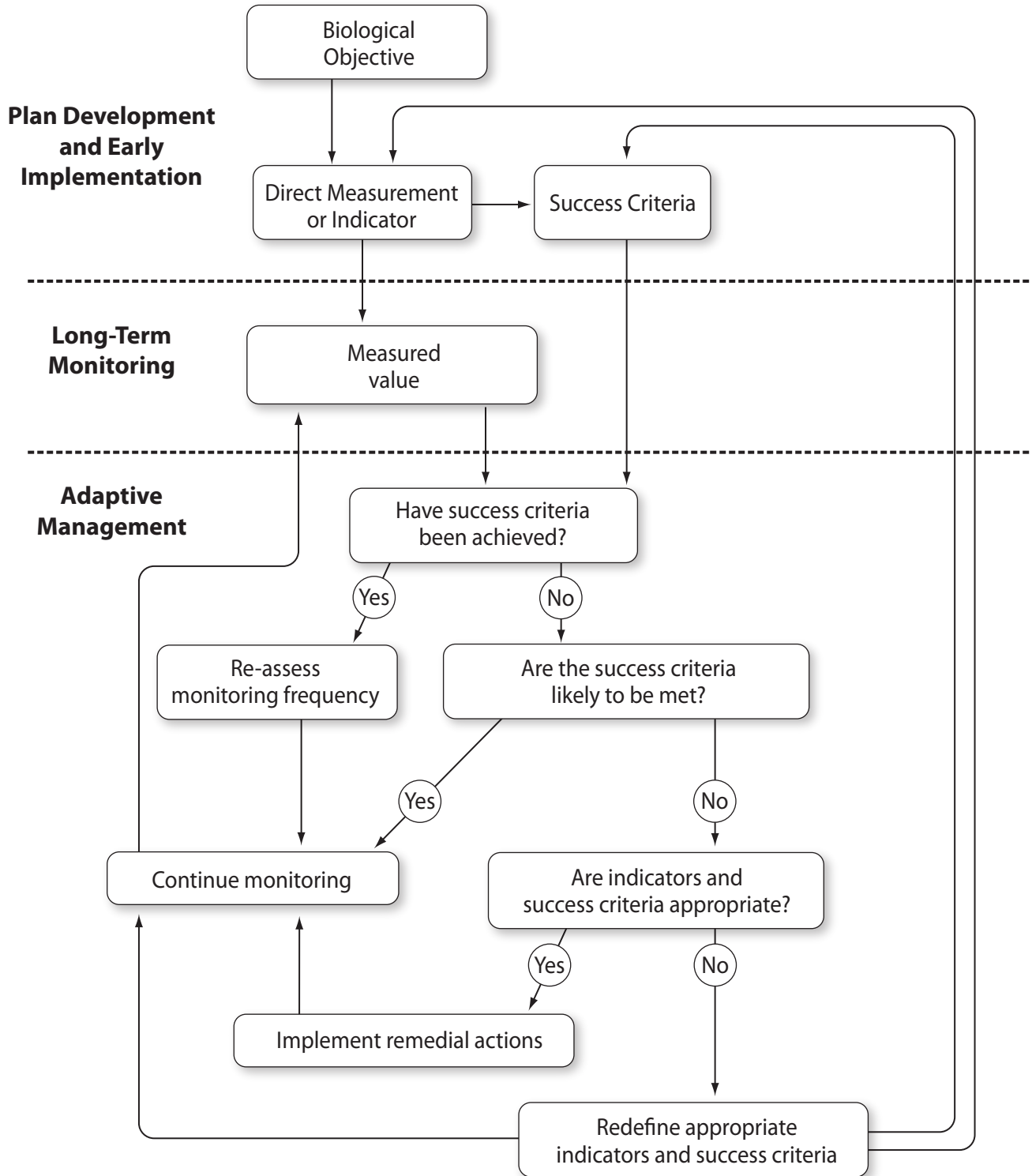
**Figure 7-2**  
**Adaptive Management Process**



T = Monitoring in unit where treatment is applied  
C = Monitoring in control unit

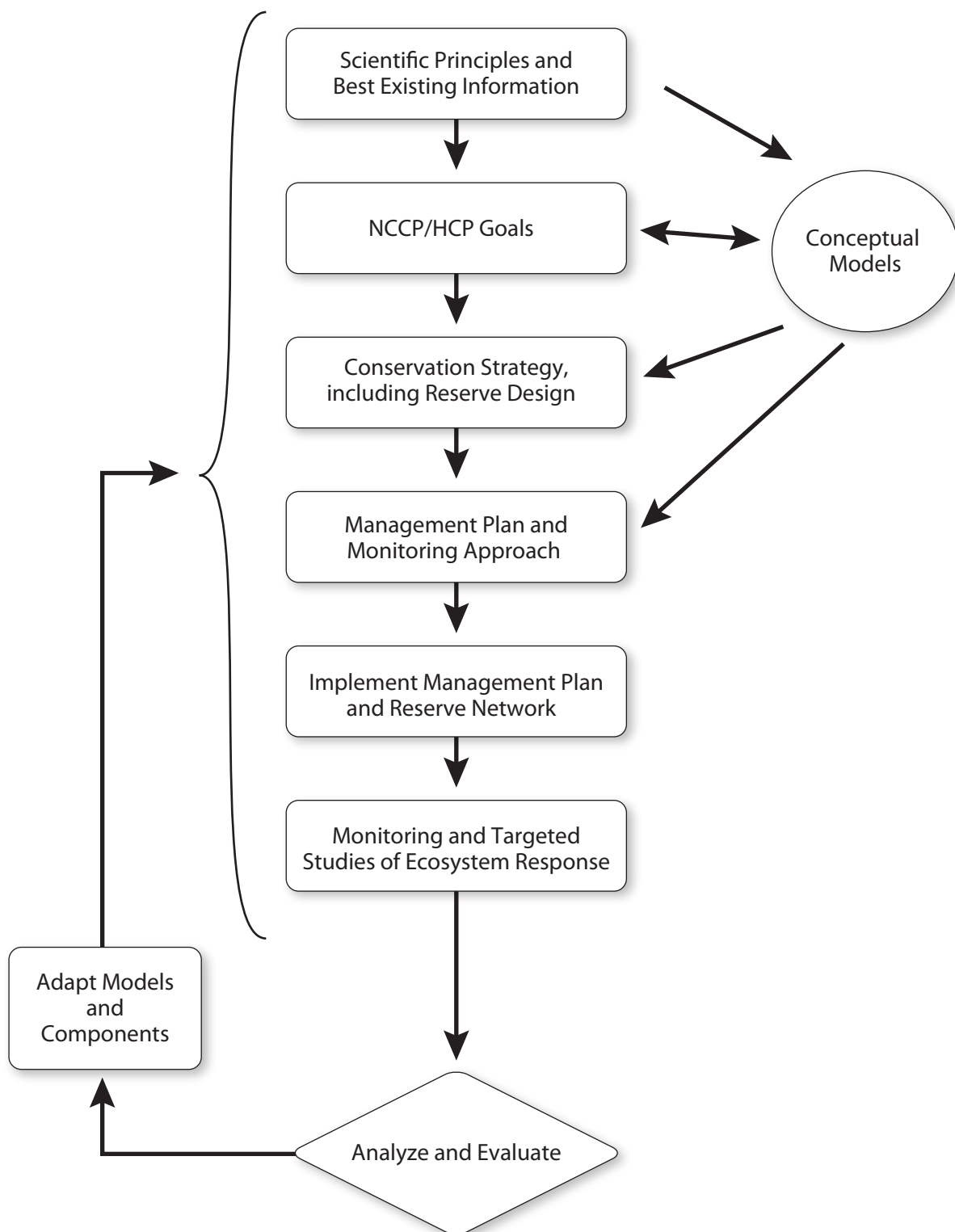
Adapted from Elzinga et al. 1998.

**Figure 7-3**  
**Continuum of Experimental Management**



Adapted from Draft Guadalupe River Project, Downtown San Jose, California, Mitigation Monitoring Report (Jones & Stokes 2002)

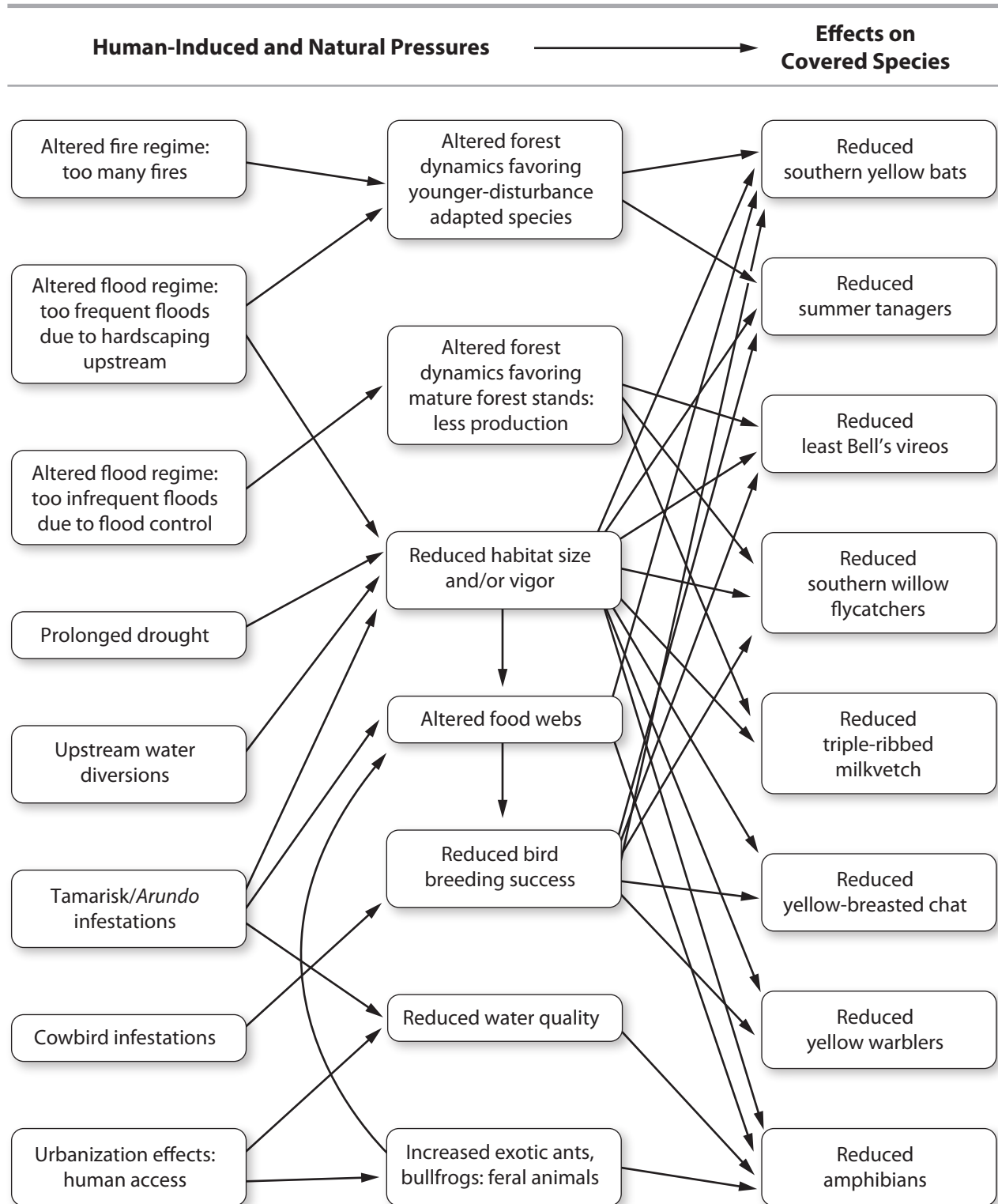




Excerpted from Atkinson et al. 2004.

**Figure 7-5**  
**Adaptive Management Feedback Loop**

## *Riparian Habitat Threats Model*

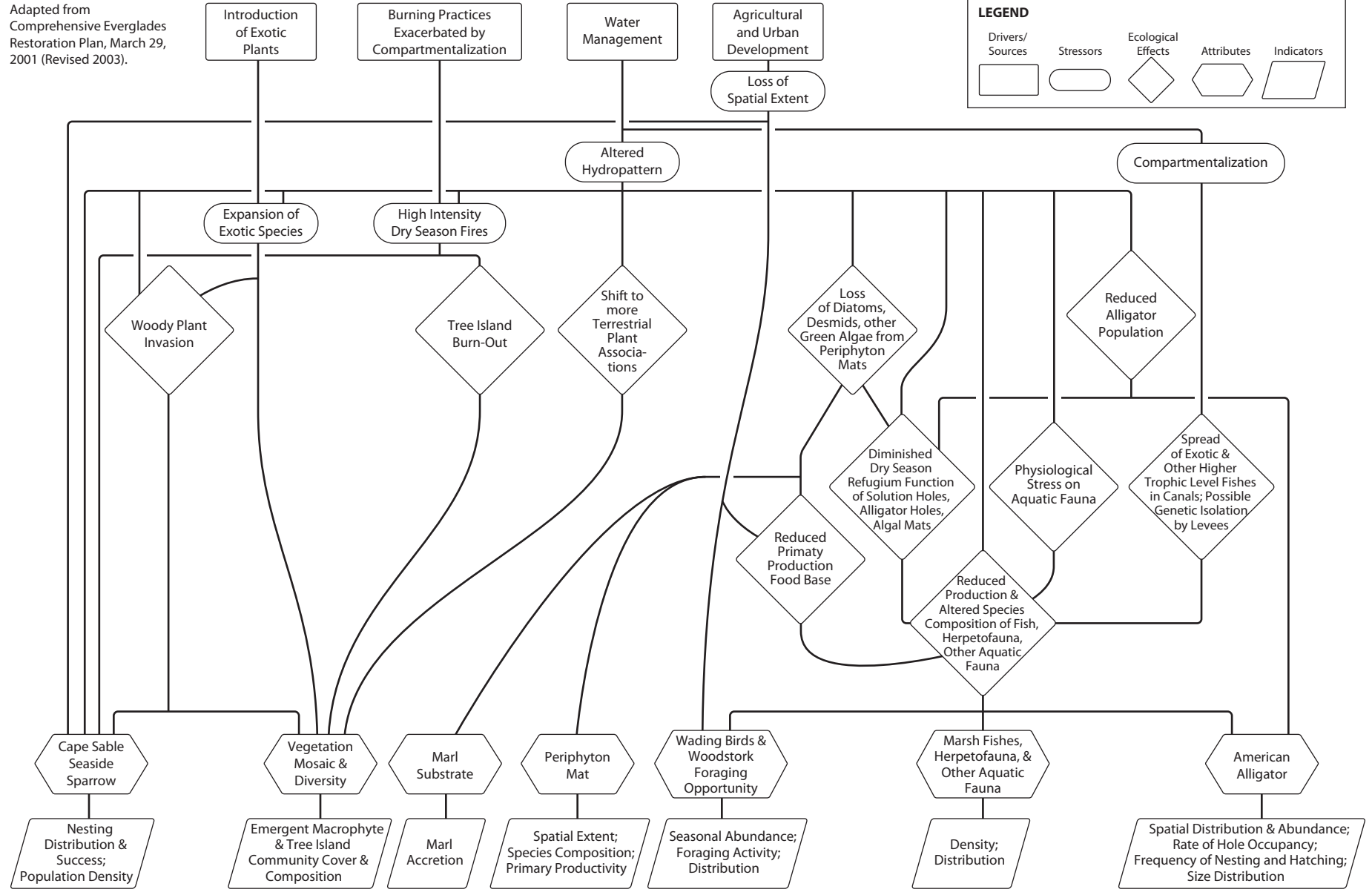


Adapted from Coachella Valley Multiple Species Habitat Conservation Plan.

**Figure 7-6**  
**Example Stress-Response Model 1**

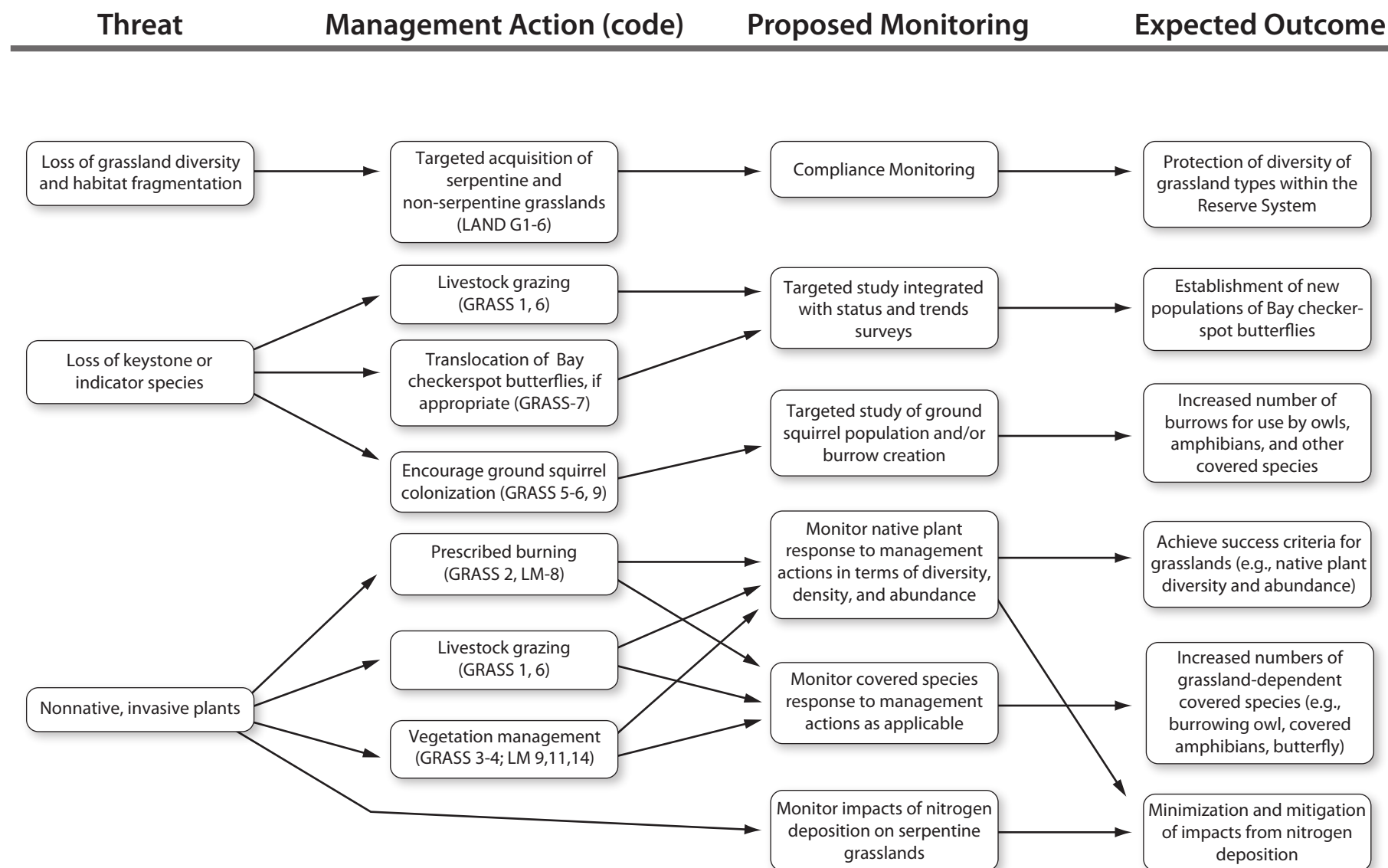
# *Southern Marl Prairies Conceptual Ecological Model*

Adapted from Comprehensive Everglades Restoration Plan, March 29, 2001 (Revised 2003).

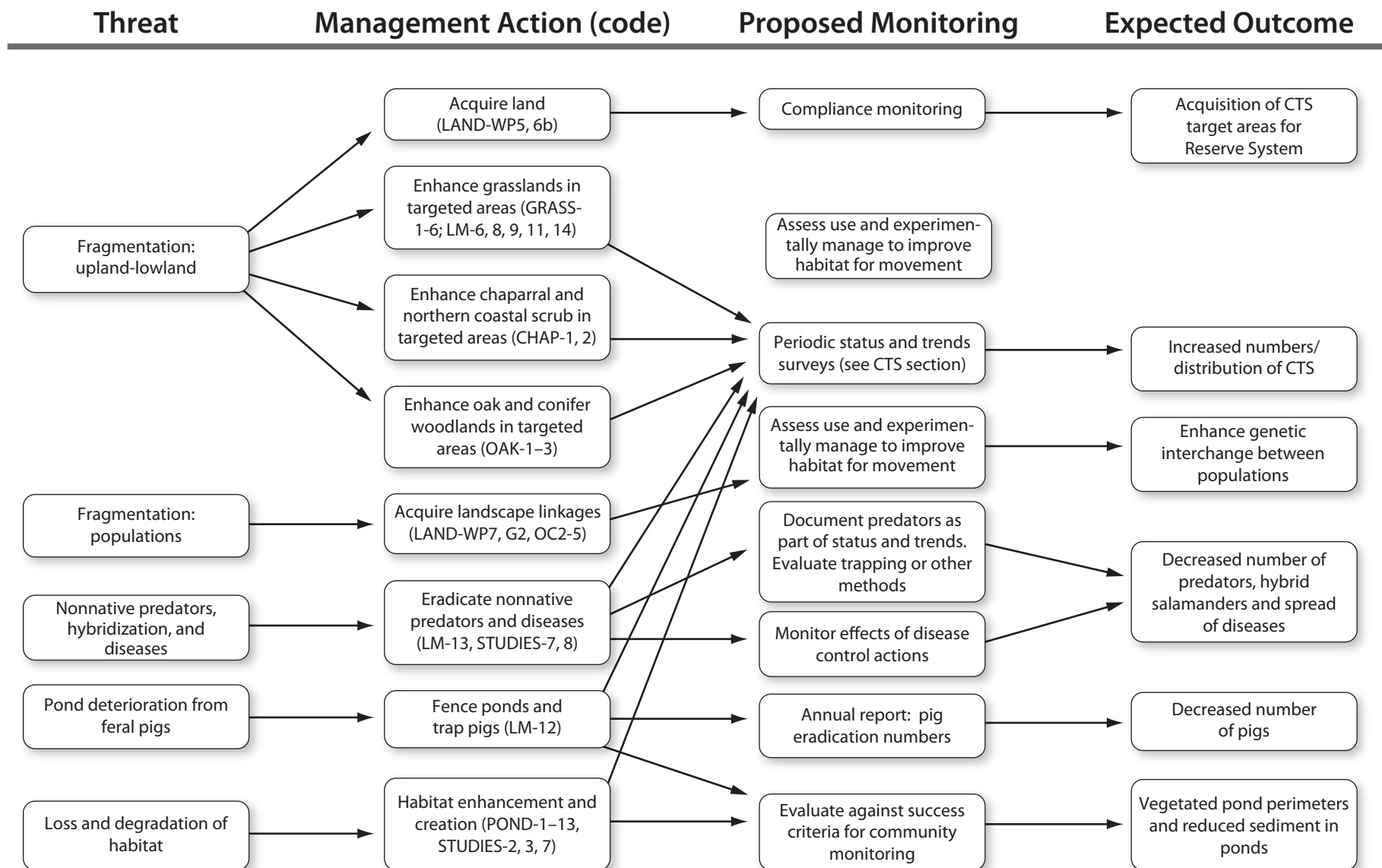


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**Figure 7-7**  
**Example Stress Response Model 2**



**Figure 7-8**  
**Adaptive Management and Monitoring**  
**Conceptual Model for Grassland**



**Figure 7-9**  
**Adaptive Monitoring and Management Conceptual Model for**  
**California Tiger Salamander**



## Chapter 8

# Plan Implementation

### 8.1 Overview

Implementation of the Santa Clara Valley Habitat Plan begins when the Implementing Agreement is executed, the Section 10(a)(1)(B) incidental take permits and NCCP permit are issued, and the local ordinances take effect. Primary responsibility for Plan implementation rests with the Permittees. However, as described in this chapter, other groups are responsible for implementing some aspects of the Plan. The successful execution of the conservation strategy, monitoring program, covered activity approvals, and reporting that are part of the Plan require coordinated actions among the Permittees, Wildlife Agencies, public land managers, and the private sector.

This chapter describes the overall implementation policies of the Plan, including institutional arrangements, organizational structure, approval processes, land acquisition, and roles and responsibilities of signatories to the Implementing Agreement and other stakeholders.

### 8.2 Implementation Structure

Day-to-day implementation of the Habitat Plan will be managed by staff of the Implementing Entity. The Implementing Entity has the authority to delegate some of its responsibilities to other entities including government agencies and nongovernmental organizations, though the Implementing Entity is ultimately responsible for ensuring implementation of the Habitat Plan. Many existing organizations and agencies in the Santa Clara County area already have significant expertise and experience in performing the necessary functions of the Implementing Entity. The Implementing Entity may be able to more effectively and efficiently ensure implementation of the Habitat Plan by contracting with these existing institutions. However, the Implementing Entity will have the authority to directly implement all aspects of the Habitat Plan itself should this be necessary. Options that could be considered to implement some or all of the duties of the Implementing Entity include those listed below.

- Staff hired by the Implementing Entity and independent of other agencies.
- A land trust specifically formed to help implement the Plan.

- Contracts with existing organizations that have relevant experience and expertise, such as experience with land management or monitoring (e.g., Open Space Authority, County Parks).

Other organizations with important roles in Plan implementation include the Wildlife Agencies, other public and private land management organizations, science advisors, and the public. The roles, responsibilities, and relationships of each group are described below and illustrated in **Figure 8-1**. Unless otherwise stated, all obligations and responsibilities described in this chapter rest with the Permittees and the Implementing Entity.

## 8.2.1 Permittees

The following agencies will be Permittees under the Plan.

- City of Gilroy.
- City of Morgan Hill.
- City of San José.
- County of Santa Clara.
- Santa Clara Valley Water District.
- Santa Clara Valley Transportation Authority.
- The Implementing Entity.

It is expected that each of these agencies will be a Permittee on the ESA Section 10(a)(1)(B) incidental take permit and the NCCP Act permit providing authorization for take that occurs from their covered activities and from covered activities within their respective jurisdictions (Chapter 2). Each will also be a signatory to the Plan's Implementing Agreement. The Permittees will vest the responsibility for implementing the Plan to the Implementing Entity as described below. To that effect, the Implementing Entity will oversee implementation of the Plan on behalf of the Permittees. However, the Permittees will ultimately be responsible for compliance with all the terms and conditions of the Plan's permits and for the performance of the Implementing Entity. Each local jurisdiction will designate staff to advise the Implementing Entity on Habitat Plan implementation (**Figure 8-1**) and provide a point of contact at the local jurisdiction for the Plan.

Many applications for coverage under the Habitat Plan will be submitted by private project proponents in the participating cities and the County. Each of these jurisdictions will be responsible for confirming that a project within its jurisdiction is eligible for coverage and for determining the completeness of each project application as described in Chapter 6 and in Section 8.7 *Roles and Responsibilities in Reviewing Application for Take Authorization* below. If the project is eligible for coverage and the project proponent has complied with all application requirements and other relevant terms of the Habitat Plan as determined by the participating jurisdiction, the participating jurisdiction will grant take authorization under the Habitat Plan as part of its normal project



review process (e.g., grading permit issuance, EIR certification). Participating local jurisdictions will also be responsible for reporting the relevant details of approved projects to the Implementing Entity (for entry into the Habitat Plan database and for required reporting to the Wildlife Agencies), for monitoring developer compliance with the avoidance and minimization requirements specified in the applicable conservation measures (see Chapter 6), and for collecting fees.

## 8.2.2 Implementing Entity

The Implementing Entity, proposed to be called the Santa Clara Valley Habitat Agency, is responsible for executing the requirements of the Habitat Plan, the permits, and the Implementing Agreement. The Implementing Entity will hold title to lands or easements it purchases and will oversee cooperative agreements with other land management entities that own and/or manage reserves for the Implementing Entity as part of the Reserve System. The Implementing Entity may also provide funding to local land management agencies and land trusts for them to purchase land for the Reserve System. The Implementing Entity will provide funds for reserve management and monitoring to those agencies and organizations with whom it contracts for such services.

The Implementing Entity will also coordinate with science advisors, outside consultants, and other land management agencies to ensure adequate and coordinated Plan implementation. The Implementing Entity will include, as part of staff or contract resources, a network of scientists, administrators, and other specialists that oversee and carry out planning and design, habitat restoration, monitoring, and adaptive management programs. Staff for these positions may be hired by the Implementing Entity or their functions contracted out to existing local agencies, nonprofit organizations, or private consultants. The Implementing Entity will also coordinate with Wildlife Agencies on a monthly basis and provide the Wildlife Agencies with annual reports.

The Implementing Entity will be a Joint Powers Authority (JPA) composed of the Cities of Gilroy, Morgan Hill, and San José, and the County. The JPA is limited to the four participating jurisdictions because the Joint Exercise of Powers Act requires that a JPA can only exercise powers held by all the participating agencies. Of the participating agencies, only the four jurisdictions have the authority to adopt the Habitat Plan fees (see Chapter 9 for details). Because all of the Permittees are responsible for implementing the Habitat Plan, all of the Permittees will have a role in the Implementing Entity.

The Implementing Entity will have two decision-making bodies, a Governing Board and an Implementation Board, as described below.

## Implementing Entity Governing Board

The Governing Board of the Implementing Entity will be composed of two representatives of each of the four participating jurisdictions, for a total of eight members. Each representative will be an elected official from the participating jurisdiction. The Governing Board is responsible for the governance and administration of the Implementing Entity. It may delegate its authority to the Implementing Board except for two duties that must remain with the Governing Board: adoption and modification of Habitat Plan fees and the approval of the Implementing Entity's annual budget. The Governing Board will meet at least twice each year.

## Implementing Entity Implementation Board

The Implementation Board will have representation by all Permittees. The 11-member Implementation Board will have two representatives each from the Permittees except for VTA, which, per its request, will have one representative. For the Permittees with two representatives, one must be an elected official. The Implementation Board will meet at least once every two months. The responsibilities of the Implementation Board will include, but are not limited to the following.

- Reviewing and making recommendations to the Governing Board regarding the adoption or modification of fees.
- Review and making recommendations to the Governing Board of annual operating and capital budgets of the Implementing Entity.
- Making decisions regarding the appointment of the Administrative Director and the hiring of or contracting with other Implementing Entity staff, services, or equipment.
- Making decisions regarding property acquisition or conservation easement purchase.
- Reviewing and making recommendations to the Administrative Director regarding grants and other funding opportunities.
- Establishing any committees or subcommittees to help the Implementing Entity fulfill its duties.
- Review and approval of annual reports prior to submittal to the Wildlife Agencies.
- Review of special cases of covered activities not subject to the jurisdiction of a Permittee (e.g., Participating Special Entities; see Section 8.4 *Participating Special Entities* below).
- Review and approval of requests by Permittees or private project proponents to provide non-monetary compensation for impacts in lieu of fees (see Chapter 9 for these provisions).

- Resolution of disputes among Permittees regarding implementation of the Plan.

## Implementing Entity Administration

Implementation tasks include support of permanent and seasonal administrative and technical staff who will be responsible for overseeing and ensuring the day-to-day tasks of implementing the Habitat Plan “on the ground.” Some or all of the activities of day-to-day implementation may be delegated to and carried out by contract agencies (including Permittees), nonprofit organizations, or contractors that specialize in the necessary functions and duties.

Implementing tasks will also address Plan activities such as identifying and acquiring suitable conservation properties, conducting inventories and monitoring surveys on Habitat Plan reserves, managing lands in the Reserve System, restoring wetlands and streams, creating ponds, maintaining a database of relevant information, tracking land cover and habitat losses and conservation, and reporting all relevant information to the Wildlife Agencies annually. All responsibilities of the Implementing Entity are described below in Section 8.3 *Responsibilities of the Implementing Entity*.

The Implementing Entity will receive advice from the groups discussed in the following sections. The ultimate decisions for all day-to-day activities of the Plan rest with the Implementing Entity and its Implementation Board.

### 8.2.3 Other Land and Water Management Agencies

Local land and water management agencies other than the Permittees are also important to the Plan’s success. Habitat Plan reserves will often border existing parks or public lands owned by other public agencies or private land trusts.

Land and water managers from relevant local organizations will be invited to coordinate closely with the Implementing Entity to ensure that management actions are compatible and consistent across the region. Significant cost savings can be achieved by coordination of local land and water management agencies in undertaking joint management actions that are consistent with this Plan.

### 8.2.4 Technical Advisory Committee

Many of the land management tasks outlined in Chapter 5 are common to other land management agencies in the county. Therefore, the Implementing Entity would benefit from the advice and partnerships with other land management agencies to perform common tasks. The Implementing Entity will form a Technical Advisory Committee that includes reserve management staff of the

Implementing Entity, staff representing the Permittees, and possibly third party contractors or other partners. Representatives of the Wildlife Agencies will serve as members of the Technical Advisory Committee. Senior managers of other local land management agencies could be invited to participate to share best practices and resources. The Technical Advisory Committee would serve as a coordinating body to provide advice on land management, monitoring, and other Habitat Plan activities in the Reserve System. Biologists at Local Partner agencies could also serve as members of the Technical Advisory Committee, if appropriate. The frequency of meetings of the Technical Advisory Committee will be determined by the Implementing Entity based on need and the activities of the Plan. The Technical Advisory Committee may form subcommittees to address specific issues. The Technical Advisory Committee may sunset at the end of the permit term.

## 8.2.5 Wildlife Agencies

It is important that the Wildlife Agencies (i.e., USFWS and CDFG) remain as active participants in the implementation of the Habitat Plan. The Wildlife Agencies are responsible for providing guidance to the Implementing Entity and Permittees on how to fulfill the terms of the permits. The Wildlife Agencies also share responsibility to monitor Plan compliance and notify the Implementing Entity as soon as possible if the Plan is not being implemented to their satisfaction. Wildlife Agency staff will take an active role in Plan implementation through review and approval of draft reserve unit management plans and specific covered activities (see Section 8.7.3 for a complete list of covered activities that require additional Wildlife Agency review). The Wildlife Agencies will also review and approve all land acquisition proposals to ensure consistency with the Habitat Plan conservation strategy described in Chapter 5.

The Wildlife Agencies will also assist the Implementing Entity in attempting to secure state and federal funding for Plan implementation (see Chapters 9 and 10). It is expected that the Wildlife Agencies will periodically attend Governing Board and Implementation Board meetings to assist their efforts to ensure that the Plan remains in compliance. Representatives of these agencies will serve as advisory members to the Governing and Implementation Boards and the Technical Advisory Committee.

To ensure regular communication between the Implementing Entity and the Wildlife Agencies, the Implementing Entity will convene and facilitate regular coordination meetings with Wildlife Agency staff to keep them apprised of progress towards conservation goals and objectives, Plan compliance, funding, monitoring and adaptive management, and other relevant topics. Meeting frequency will vary but will likely be monthly or bi-monthly during the first several years of implementation to ensure close communication. These meetings will serve as a means for the Wildlife Agencies to provide advice to the Implementing Entity prior to implementation of key conservation actions such as land purchases, aquatic conservation, habitat restoration, and adaptive management and monitoring. The meeting will also serve as a forum to

troubleshoot issues that arise before they influence permit compliance. These meetings may be separate discussions or part of Technical Advisory Committee meetings.

As stated in Chapter 5, the Wildlife Agencies will review all draft reserve unit management plans and provide comments to the Implementing Entity within 60 days of receipt of these documents. The Implementing Entity will revise the draft plan based on the Wildlife Agencies' comments, if any, and will provide a revised draft to the Wildlife Agencies, which will have an additional 60-day review period. If an initial draft reserve unit management plan or any subsequent revised draft reserve unit management plan adequately addresses a Wildlife Agency's comments, the Wildlife Agency will so notify the Implementing Entity within 60 days, and the reserve unit management plan will be deemed to be approved by that Wildlife Agency for purposes of this Plan, the Implementing Agreement, and the permits. In addition, if a Wildlife Agency does not provide comments within 60 days after receiving the revised draft reserve unit management plan, the Wildlife Agency will thereafter be deemed to have approved the revised draft plan for purposes of this Plan, the Implementing Agreement, and the permits. The Implementing Entity will incorporate comments submitted by the Wildlife Agency after the 60-day period in the revised draft reserve unit management plan to the extent that the Implementing Entity determines the comments can be incorporated.

As stated in Chapter 5, the Wildlife Agencies will review all land acquisition proposals and provide comments to the Implementing Entity within 30 days of receipt of each of these documents. The Implementing Entity will incorporate changes to the documents and provide revised drafts to the Wildlife Agencies within 15 days. These deadlines are established to ensure the timely review and comment on the documents by Wildlife Agency staff and to enable the Implementing Entity to acquire land as soon as possible. If the Wildlife Agencies do not respond within 30 days, the Implementing Entity may proceed with the land acquisition.

A subset of the covered activities will require additional review and approval by the Wildlife Agencies to ensure that the covered activity is adequately defined, consistent with the Habitat Plan, and incorporates appropriate conditions of approval in Chapter 6. See Section 8.7.3 *Wildlife Agency Responsibilities* for more discussion of this responsibility. See Section 7.2.3 *Program Implementation* for the Wildlife Agencies' role in the implementation of the monitoring program.

## Dispute Resolution

The Implementing Entity and the Wildlife Agencies will strive at all times to work in good faith with each other to reach mutual agreement on key implementation tasks such as adaptive management, monitoring, and conservation actions. If disagreements arise that cannot be resolved easily, the Implementing Entity will follow the "meet and confer" dispute resolution process outlined in Section 6.6.1 of the Implementing Agreement, and if necessary, the

“elevation of dispute” process outlined in Section 6.6.2 of the Implementing Agreement (**Appendix B**).

## Permit Suspension or Revocation

The Wildlife Agencies have the ability in accordance with applicable State and Federal law to suspend or revoke all or part of the permits in the event that any of the Permittees are out of compliance with the Plan, the Implementing Agreement, or the permits. The USFWS has the ability to suspend or revoke all or part of the ESA permits if continuation of covered activities appreciably reduces the likelihood of the survival and recovery of the species in the wild<sup>1</sup>. CDFG has the ability to suspend or terminate all or part of the NCCP permit if revocation or termination is required to avoid jeopardizing the continued existence of that portion of a covered species’ (listed or non-listed) range that occurs within the Plan area and to fulfill a legal obligation of the CDFG under the NCCP Act<sup>2</sup>. If such a situation arises, the Wildlife Agencies will notify the Permittees of the actions they must take, if any, to prevent jeopardy to the listed species and maintain the permits, giving the Permittees a reasonable opportunity to implement such actions. See the Implementing Agreement for details.

If one or more of the permits are revoked, the Permittees have the obligation to fulfill all outstanding mitigation requirements, including management and monitoring of the Reserve System in perpetuity, for any take that occurs prior to the revocation. For example, if the Permittees were behind on compliance with the Stay-Ahead provision for land acquisition or restoration, they would be required to meet this obligation (see Section 16.7 of the Implementing Agreement for details [**Appendix B**]).

### 8.2.6 Scientific Review

The adaptive management process described in Chapter 7 requires that the Implementing Entity consult scientists outside of the Implementing Entity to help advise them on issues related to habitat management and monitoring (see also subheading *Structure of the Adaptive Management Decision-Making Process* below). Scientists with expertise in conservation biology, management of local natural communities and agricultural lands, and the ecology of covered species will be consulted by the Implementing Entity to provide input, as appropriate. The scientific expert’s primary function is to provide technical advice and help assemble the best available scientific data on reserve assembly, monitoring, and adaptive management. A separate group of scientists will be convened in an Independent Conservation Assessment Team to provide input on the overall Plan progress at least every five years. More detail on the structure, role, and schedule of this scientific input is provided in Chapter 7, Section 7.2.3 *Program*

<sup>1</sup> 50 Code of Federal Regulations Sections 13.28–13.29, 50 Code of Federal Regulations Sections 17.22(b)(8) and 17.32(b)(8).

<sup>2</sup> California Fish and Game Code Sections 2820 and 2823.

*Implementation* subheading *Independent Conservation Assessment Team*. Scientists may be consulted after the permit term to continue to provide advice on monitoring and adaptive management.

## 8.2.7 Public Input

Public input is fundamental to ensuring the success of and continuing support for the Plan throughout implementation. The NCCP Act requires that the Implementing Agreement provide for periodic reporting to the public on the progress of NCCP implementation. Meetings of the Governing Board and Implementation Board will be open to the public, and public comments will be solicited and heard at each meeting<sup>3</sup>. In addition, the public can contact the staff of the Implementing Entity to comment on various aspects of Plan implementation. All data and reports associated with the monitoring program for this Plan will be available to the public, with the exception of reports documenting surveys on private lands considered for acquisition or conservation easements not yet acquired by the Implementing Entity. Monitoring reports will also be posted on the Habitat Plan web site.

### Public Advisory Committee

The Implementing Entity will establish and appoint a public advisory committee to solicit input from stakeholders with interest in Plan implementation. The committee will advise the Implementing Entity. Staff from the Permittees should participate in public advisory committee meetings to help ensure broad coordination among those parties interested in and responsible for implementing the Plan. Meeting frequency will be determined by the Implementing Entity and the committee; quarterly meetings are recommended initially. Meetings will be open to the public. The committee may sunset at the end of the permit term.

The public advisory committee can provide input to the Governing and Implementation Boards, Technical Advisory Committee, and staff on all aspects of Plan implementation, with an emphasis on the following topics.

- Expenditure of funds for habitat conservation actions.
- The general application of conditions on covered activities (Chapter 6).
- Achieving the biological goals and objectives of the Plan.
- Operation of reserves, monitoring, and adaptive management.
- Technical information and expertise regarding monitoring, management, and restoration.
- Adherence to Plan commitments (e.g., No Surprises, neighboring landowner assurances).

<sup>3</sup> The Governing Board may need to also hold periodic closed-door sessions to discuss confidential items such as land transaction negotiations or legal matters.

## Annual Public Meeting

At least once annually, the Implementing Entity will convene a meeting to report on the progress of implementation directly to the public. The Implementing Entity will summarize habitat losses and gains, habitat restoration and creation, and management and monitoring accomplishments for the previous year. The meeting will provide an informal forum for the public to pose questions and provide comments directly to the Implementing Entity on the overall progress of Plan implementation. The annual public meeting may coincide with one of the regular Governing Board or Implementation Board meetings. Periodic formal review of Plan progress in a public forum may also be appropriate and could perhaps coincide with the 5-year conservation reviews by the Independent Conservation Assessment Team (see Section 7.2.3 *Program Implementation* subheading *Independent Conservation Assessment Team*).

## 8.3 Responsibilities of the Implementing Entity

The Implementing Entity is tasked with the actual implementation of the Plan. As described above, the Implementing Entity will be receiving advice on Plan compliance and implementation from a variety of sources, including the Wildlife Agencies, science advisors, and the public. The Implementing Entity will seriously consider all of this advice to implement the Plan effectively and cost-efficiently. The Wildlife Agencies have review and approval authority over certain components of implementation (e.g., land acquisition, reserve unit management plans, reservoir-specific dewatering plans, and major changes in monitoring and adaptive management). However, the ultimate decisions for Plan implementation and compliance with the permits, Implementing Agreement, and Habitat Plan rest with the Implementing Entity.

Although the Implementing Entity is responsible for all of these tasks, it may contract with a Permittee, other local organization, or consultants to perform one or more of their responsibilities. These responsibilities include but are not limited to those listed below.

### Administration

- Developing and maintaining annual budgets and work plans.
- Developing standardized forms and checklists for Application Package processing.
- Obtaining grants and other outside funding sources, including tracking and reporting grant compliance.
- Collecting Habitat Plan fees from Permittees directly for their covered activities or from participating jurisdictions after they collect fees from private project proponents (as described in Chapter 9).



- Receiving, managing, tracking, reporting, and expending funds to implement the Plan.
- Training staff of local jurisdictions to review applications for take authorization under the Plan. Assisting local jurisdictions to ensure that project proponents comply with the conditions on covered activities described in Chapter 6.
- Providing tools to the Permittees to support the application review process.
- Serving as the final arbiter of whether a project or activity is covered under the Plan.
- Administering the Neighboring Landowner Assurances program described in Chapter 10.
- Creating and maintaining a database to track Plan compliance, which includes 1) implementation of all conservation actions, 2) progress towards the biological goals and objectives, 3) implementation of the monitoring and adaptive management program, 4) implementation of conditions on covered activities, and 5) all impacts on land cover types, modeled habitat for covered species, occupied habitat for selected species, and covered plant occurrences.
- Creating and maintaining a database and models to support the evaluation of land acquisition opportunities and other conservation actions to meet the requirements of the Plan.
- Ensuring that conservation actions are being implemented roughly proportional in time and amount to the impacts on land cover types authorized under the Plan (e.g., see Section 8.6.1 *Stay-Ahead Provision*), and forecasting land acquisition needs in order to comply with the Stay-Ahead provision.
- Notifying the Permittees of the requirement to make the land in lieu of fee provision compulsory when the Plan is out of compliance or in jeopardy of being out of compliance with the Stay-Ahead provision, as well as notifying them when this requirement may be lifted (see Section 8.6.1 *Stay-Ahead Provision*). Land acquired must always meet the requirements of the Plan as described in Chapter 5.
- Calculating and publicizing the amounts of annual fee adjustments and distributing these calculations to the Permittees, in accordance with Chapter 9.
- Performing the periodic fee assessments described in Chapter 9.
- Convening regular meetings (i.e., Wildlife Agencies, Public Advisory Committee, Annual Meeting, Independent Conservation Assessment Team).
- Preparing the Annual Reports (see Section 8.10 *Data Tracking* below).

## Conservation Implementation

- Implementing all conservation actions described in Chapter 5 or coordinating with partners to implement conservation actions, and ensuring compliance with all Plan requirements.
- Researching land acquisition opportunities (fee title or conservation easement) to meet the requirements of the Plan.
- Negotiating and securing land and water acquisition or conservation easements with private landowners.
- Negotiating land acquisition or conservation easements in partnership with other organizations.
- Coordinating with Permittees to ensure that the Plan is implemented consistently and effectively.
- Reviewing offers of land in lieu of fees that may be made by project proponents (see Section 8.6.7 *Land Dedication In Lieu of Development Fee*) or conservation action in lieu of fees by a Permittee and making determinations on other implementation matters that require approval of the Implementing Entity, as specified in this Plan or the Implementing Agreement.
- Monitoring and enforcing, if necessary, landowner compliance with conservation easement terms<sup>4</sup>.
- Developing enforcement procedures for the Reserve System and individual reserves (e.g., public and pet access controls) that will be incorporated into the reserve unit management plans.
- Developing reserve unit management plans for groups of parcels that share common land cover types and habitats.
- Designing and implementing habitat enhancement, restoration, and creation projects and managing the affected areas in an adaptive management framework (see additional detail below). This task includes developing site-specific restoration management plans.
- Obtaining additional permits for site-specific projects in the Reserve System (e.g., wetlands permits and cultural resources compliance for restoration projects), as needed.
- Conducting outreach to landowners, local community groups and agencies, and the general public regarding the Plan and its goals.
- Developing and managing a volunteer program to provide an opportunity for the public to contribute to the successful implementation of the Plan.
- Periodic mapping of the study area to update the land cover maps and habitat models and calculations. Modeled habitat impacts (**Table 4-4**) and modeled

<sup>4</sup> Enforcement actions on private land under conservation easement for the Reserve System would be conducted by the Implementing Entity with assistance from the appropriate local jurisdiction. Enforcement actions on land in the Reserve System owned by a public agency would be conducted by that agency with assistance from the Implementing Entity.

habitat acquisition requirements (**Table 5-17**) will be tracked based on the most recent models available. Implementation of conditions described in Chapter 6 (e.g., species surveys) and the conservation strategy (Chapter 5) will be informed by the most current land cover maps and habitat models updated and maintained by the Implementing Entity as needed throughout the permit term.

- Coordinating and communicating with local land management agencies.
- Designing a scientifically valid monitoring program and monitoring habitat and species on reserves (see additional detail below and in Chapter 7), including site inventories, targeted studies, compliance monitoring, effectiveness monitoring, and status and trend monitoring.
- Monitoring changed circumstances identified in Chapter 10 that might arise and if they do, following the remedial measures and procedures outlined in Chapter 10.
- Developing partnerships with local academic institutions to help direct research towards management and monitoring needs of the Plan.
- Conducting or overseeing land and water management activities that are part of the conservation strategy.
- Monitoring and tracking land acquisition and other conservation actions within and adjacent to the study area performed by others to ensure coordination and compatibility with Plan actions.
- Developing and conducting educational programs for landowners and the public consistent with the conservation strategy.
- Ensuring involvement of the public, science advisors, interested agencies, and others in Plan implementation.

The Implementing Entity will utilize specialists as needed to ensure proper implementation of these tasks. Key functions and roles are described below and illustrated in **Figure 8-2**. The Implementing Entity will have several core staff members that are dedicated to Plan implementation, as described below.

### 8.3.2 Administrative Director

The administrative director would be a staff person dedicated to the Plan who reports to the Implementation Board and directs the activities of the Implementing Entity. The administrative director is responsible for implementing all of the tasks listed above, including periodic reporting to the Implementation Board. The administrative director will also oversee periodic reviews of the Permittees to ensure compliance with the terms of the permits, Implementing Agreement, and Plan on behalf of all Permittees. Finally, the administrative director will serve as the primary link between Implementing Entity staff, local jurisdictions, Wildlife Agencies, other decision makers, and the general public.

### **8.3.3 Science**

Scientific expertise is needed within the Implementing Entity to help direct all technical aspects of Plan implementation, including land and water management and the monitoring and adaptive management program. Implementing Entity staff or designees will collect and analyze data as required by the Plan, keep abreast of current scientific methods and concepts, and provide continuous oversight of the monitoring and adaptive management program (e.g., monitoring methods, study designs) to ensure that the Reserve System incorporates the most appropriate strategies with the latest technology and best management practices. The Implementing Entity will be responsible for communication with external scientists, including agency scientists and the larger conservation science community. The Implementing Entity must also encourage relationships with agency and academic scientists to facilitate collaborations that will contribute to the Plan's conservation goals.

### **8.3.4 Real Estate Activities**

The Implementing Entity conducts relevant financial and legal analyses to guide selection of parcels for the Reserve System, and conducts or manages appraisals and transactions. A specialist will be needed with expertise in real estate law, zoning, and local regulations to fulfill the fiduciary duties of the Implementing Entity for its properties. The Implementing Entity may work with other organizations who partner with it to acquire land to fulfill requirements of the Plan. Existing agencies may already have staff with these skills; the Implementing Entity could partner with such agencies to obtain these skills externally.

### **8.3.5 Grant Administration**

The Implementing Entity is responsible for managing all grants, contracts, and other funding sources during Plan implementation. The Implementing Entity must establish clear accounting procedures and methods for disbursing funds and actively pursue and acquire additional funding for Plan implementation. The Implementing Entity will actively write grant applications to secure these funds. The Implementing Entity may work with other organizations who partner with it to seek grants to fulfill Plan requirements. Existing agencies may already have staff with these skills; the Implementing Entity could partner with such agencies to obtain these skills externally. For any grants received, the Implementing Entity must also monitor, track, and report to the granting agency according to the grant requirements.

### **8.3.6 Budget Analysis**

The Implementing Entity is responsible for developing and monitoring budgets, processing invoices, managing financial reserves, identifying cost savings, and managing administrative contracts (e.g., liability insurance). The Implementing Entity must also track expenditures and cash flow and establish and maintain an internal accounting system and procedures.

### **8.3.7 GIS/Database Maintenance**

The Implementing Entity will use GIS or other equivalent spatially-explicit database systems to collect, store, and utilize relevant spatial data necessary for Plan implementation and maintain them to track compliance and to guide reserve design and monitoring and adaptive management programs. For example, the Implementing Entity must be able to query the database to summarize take and conservation by year (by land cover types, plant occurrences, and modeled habitat for covered species) and cumulatively. The Implementing Entity will track all data related to the progress of meeting Plan goals and objectives. The Implementing Entity will also ensure development and management of the public website for the Habitat Plan.

### **8.3.8 Reserve Management and Monitoring**

The Implementing Entity will direct the management of land acquired for the Reserve System and coordinate with managers of other protected areas to form a biologically cohesive network of protected lands in the study area. These activities will include regular patrol, trash removal, fence/gate installation and repair, road maintenance, and other necessary activities.

Some conservation actions that occur either in or outside the Reserve System may be performed by a Permittee. The Implementing Entity will coordinate with these Permittees and other local agencies to conduct conservation actions that it cannot perform itself or would perform less efficiently.

The Implementing Entity is responsible for developing reserve unit management plans for all units of the Reserve System to guide site-specific management (see Chapter 5). The Implementing Entity will develop site restoration plans (see Chapter 5), including designs and construction drawings, or will oversee contractors conducting these tasks. The Implementing Entity will also be responsible for interim management of acquired lands prior to completion of these reserve unit management plans.

The Implementing Entity is responsible for designing and implementing the monitoring and adaptive management program described in Chapter 7. The Permittees and the Implementing Entity are responsible for all management and monitoring on the Reserve System after the permits expire (i.e., in perpetuity).

## Management Conducted by Third Parties

The Implementing Entity may contract with a third party landowner, contractor, or other agency or organization to conduct management activities within the Reserve System on the Implementing Entity's behalf. Some of these management activities may result in take of covered species, as described in Chapter 4. To ensure that the third party manager adheres to the terms of the Habitat Plan, the permits, and the Implementing Agreement, the Implementing Entity will enter into a contract with this third party. The contract will specify the work to be performed, the applicable terms of the Habitat Plan and permits, and the take authorization that is extended to the third party, if applicable.

If a third party conducts land management on behalf of the Implementing Entity, another party must conduct the monitoring of those management activities to ensure independent assessment of the effectiveness of those actions.

## Structure of the Adaptive Management Decision-Making Process

Key to the success of the adaptive management program is a clear and effective structure for making decisions on the basis of new data from Plan monitoring and information from other sources. The organizational structure of the monitoring and adaptive management decision-making process is described in detail in Chapter 7 *Monitoring and Adaptive Management Program*. This structure has been designed to be efficient and agile in order to respond quickly to monitoring results or new scientific data.

In general, the Implementing Entity oversees the adaptive management and monitoring program. The Wildlife Agencies will provide input and help guide the program, but the Implementing Entity has ultimate responsibility for implementing the program and instituting changes through adaptive management. Additional responsibilities of the Implementing Entity include prioritizing management actions, disseminating information, developing annual and long-term work plans, and facilitating input from the public and outside scientists. The Administrative Director of the Implementing Entity will work with the Entity's science and management resources to implement the adaptive management and monitoring program. Reserve managers, who will be in charge of day-to-day activities within the reserves, will also contribute to annual work plans and formulate adaptive management recommendations for the Plan as a whole.

A pool of scientists will provide external input regarding implementation of the monitoring and adaptive management program. Input will be provided regularly or as needed to help guide monitoring protocols and experimental design, to interpret results and generate hypotheses, and to comment on the overall success of the monitoring and adaptive management program in achieving the biological goals of the Plan.

The Wildlife Agencies will provide feedback on the implementation of the adaptive management and monitoring program described in the annual work plans. Individuals with the Wildlife Agencies with particular expertise in management may also participate as science advisors. All forms of input will be collected by the Implementing Entity and incorporated into management and monitoring practices (see Chapter 7 *Monitoring and Adaptive Management Program* for more details). The Wildlife Agencies will have review and approval authority over major changes in the reserve unit management plans to ensure compliance with the permits, Implementing Agreement, and Habitat Plan.

An Independent Conservation Assessment Team will provide conservation reviews every 5 years. The scope of review for the Conservation Assessment Team will vary each time they are convened. The role of the Independent Conservation Assessment Team is described in detail in Chapter 7, Section 7.2.3 *Program Implementation* subheading *Independent Conservation Assessment Team*.

Local land managers will be invited to help guide Plan implementation as advisors to the Implementing Entity and the Implementation Board and these organizations will coordinate closely with the Implementing Entity. As mentioned above, these management agencies may wish to establish a formal committee to facilitate coordination and information sharing.

### **8.3.9 Public Outreach and Education**

As described in Chapter 5 (Section 5.3.2 *Landscape Conservation and Management*), the Implementing Entity will conduct outreach to local private and public landowners and residents that will include education on the management goals and objectives as well as implementation techniques. The focus of public education and outreach activities will be to raise landowner and public awareness of reserve management goals, actions and methods, and how the public can support them. To that end, the Implementing Entity will ensure development and management of a public web site for the Habitat Plan. Where appropriate, the Implementing Entity will develop and publish guidelines for local landowners and provide education programs to assist in the implementation of these guidelines. Public education and outreach will be coordinated with other local agencies providing similar services in the study area (e.g., County Parks, SCVWD, and Open Space Authority).

### **8.3.10 Legal and Financial Services**

Legal counsel will provide guidance during Plan implementation on an as-needed basis for drafting and reviewing conservation easements, reviewing land purchases, assisting with land transaction negotiations, assisting with legal challenges, and assisting with easement violations if they occur. To the extent possible, in-house attorneys for the Permittees may provide legal counsel to the

Implementing Entity. However, certain circumstances may require specialized third-party legal assistance.

Financial analysis assistance will be required periodically to review the program's cost/revenue balance and ensure that development fees are adjusted with changing land costs and inflation.

### **8.3.11 Consultants and Contractors**

Consultants will be retained to meet any technical or scientific needs that cannot be effectively or efficiently addressed through in-house staff due to insufficient expertise or availability. It is expected that consultants will be utilized more heavily during the early stages of Plan implementation, becoming less necessary as the Implementing Entity develops and becomes more familiar with the Reserve System. Contractors will be needed for construction tasks within the Reserve System requiring specialized skills or the use of heavy equipment, such as road grading, restoration grading, plant propagation, restoration planting, building recreational facilities, and water-well construction and maintenance.

### **8.3.12 Responsibilities of the Local Jurisdictions**

The local jurisdictions with land use planning and development review and decision-making authority participating in this Plan (Cities of Morgan Hill, Gilroy, San José; County of Santa Clara) have a special responsibility to assist with implementation because of their authorities as local governments. As Permittees and members of the Implementing Entity, the participating local jurisdictions will support Plan implementation by:

- Receiving, reviewing, and approving applications for take authorization under the Plan from private project proponents according to the procedures and requirements described in Chapter 6.
- Requiring private project proponents to pay Habitat Plan fees established by the Implementing Entity (see Section 8.5 *Local Implementing Ordinances*) and as described in Chapter 9.
- Periodically, and at least annually, transferring the Habitat Plan fees to the Implementing Entity to support Plan implementation.
- Reporting, at least annually, to the Implementing Entity the applications and approvals for take authorization under the Plan, including take associated with projects exempt from fees and/or conditions of this Plan.
- Monitoring the implementation of conditions on covered activities on project sites.
- Participating in the Implementing Entity's Technical Advisory Committee.
- Coordinating closely with the Implementing Entity regarding Plan implementation.



## 8.4 Participating Special Entities

Public or quasi-public entities, such as special districts or entities not subject to the jurisdiction of the Permittees, may conduct or initiate projects or ongoing activities within the permit area that could affect listed species and that may require take authorization from USFWS and/or CDFG. Such organizations may include existing or future school districts, water districts, irrigation districts, transportation agencies, local park districts, geologic hazard abatement districts, or other utilities or special districts that own land or provide public services. These public agencies, known as Participating Special Entities, can request coverage under the Plan during Plan implementation; such coverage would provide take authorization for their projects<sup>5</sup>. Municipalities that are not a Permittee are not eligible to participate using this status<sup>6</sup>. The following is a partial list of special districts that occur in the permit area and that could be eligible as a Participating Special Entity provided they meet the criteria described below.

- Community College Districts
- K-12 School Districts.
- Burbank Sanitary District.
- Central Fire Protection District.
- County Library Service Area 1.
- County Sanitation District No. 2-3.
- Guadalupe Coyote Resource Conservation District.
- Loma Prieta Resource Conservation District.
- Pacific Gas and Electric Company.
- Pacheco Pass Water District.
- Pacheco Storm Drainage & Maintenance District.
- San Martin County Water.
- West San Martin Water Company.
- Santa Clara County Lighting Service Area.
- Santa Clara County Open Space Authority.
- Santa Clara County Vector Control District.
- South County Regional Wastewater Authority.
- South Santa Clara County Fire Protection District.
- South Santa Clara Valley Memorial District.

<sup>5</sup> Private entities may be able to opt-in to the Plan through a separate process described in Section 6.7.2 *Application Process for Private Projects*.

<sup>6</sup> To join the Plan, a city or county would need to amend the Plan using the process described in Chapter 10.

- Sunol Sanitary District.

The Participating Special Entity will submit a complete application for the proposed activity directly to the Implementing Entity with copies to the local jurisdiction in which the project occurs, and the Wildlife Agencies. This application will contain the following components.

- A detailed description of and rationale for the activity proposed for coverage under the Habitat Plan.
- Proposed avoidance and minimization measures to be applied to the covered activity (see Chapter 6).
- A map of the proposed activity area.
- An analysis of the potential impacts of the proposed activity on covered species and their habitats.
- All components of the Habitat Plan application package (described in Chapter 6).
- In order to grant take authorization to these local agencies, the Implementing Entity will need a legally enforceable contractual relationship with the Participating Special Entity. The Implementing Entity will issue, at its discretion, a Certificate of Inclusion to the Participating Special Entity that will allow the proposed activity to be covered under the Habitat Plan if it finds that the conditions listed below are met.
- The Implementing Entity signs a contract with the Participating Special Entity binding it to the relevant terms of the permits, Implementing Agreement, and Habitat Plan<sup>7</sup>.
- The proposed activity complies with all terms and requirements of the Plan, the permits, and the Implementing Agreement, and the Wildlife Agencies concur.
- The impacts of the proposed activity fall within those analyzed in the Habitat Plan, the ESA Section 7 biological opinion for the Habitat Plan, and the EIR/EIS in general type, location, magnitude, and effects.
- The impacts of the proposed activity do not deplete the amount of take coverage to such an extent that not enough is available for future covered activities.
- The proposed activity does not conflict with the conservation strategy or the ability of the Implementing Entity to meet the Plan goals and objectives.

As described above, the Wildlife Agencies must approve the inclusion of the Participating Special Entities.

The Certificate of Inclusion will be issued to the Participating Special Entity by the Implementing Entity upon payment of the fee specified in the contract and completion of any other steps required by contract to occur prior to issuance of

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<sup>7</sup> In the event of failure to uphold the terms of the permit, Implementing Agreement, and Habitat Plan, the contract gives the Implementing Entity the ability to force action by the Participating Special Entity through legal means.

the Certificate of Inclusion. The Implementing Entity may require Participating Special Entities to pay fees over and above those specified in Chapter 9 to cover indirect costs of extending permit coverage under the Habitat Plan, including the costs of Implementing Entity staff time to assist with permit coverage, a portion of the costs of the initial preparation of the Plan, and a portion of the costs of conservation actions designed to contribute to species recovery. The Certificate of Inclusion will include an attached map depicting the parcel number, acreage, and owner of lands to which the take authorization(s) would apply. A template of the Certificate of Inclusion will be provided to the Wildlife Agencies for review and approval during Plan implementation, before the first Participating Special Entity is approved. Also see the Implementing Agreement for additional details and procedures that apply to Participating Special Entities. The Implementing Entity will track the amount of take authorization extended to Participating Special Entities against the total allowable take authorized under this Plan.

As described in Chapter 4, some management and monitoring activities will result in take of the covered species, even if the net result of the actions are beneficial (e.g., prescribed burning, handling species to identify or mark them). Any special district or other agency that carries out such activities on behalf of the Implementing Entity will require take authorization. If the special district or agency is either a Permittee itself, or carries out management and monitoring activities on Plan preserves as a contractor of the Implementing Entity, it will receive take authorization under the Habitat Plan permits. Management or monitoring agencies that are not a Permittee or a contractor of the Implementing Entity can secure take authorization as a Participating Special Entity.

### **8.4.1 San Martin**

The unincorporated community of San Martin, located between Gilroy and Morgan Hill, has been interested for several years in incorporating as a new jurisdiction. If this occurs during the permit term, a new town of San Martin would not be covered by the permits. To allow use of the Habitat Plan by a new jurisdiction in the permit area, the Permittees would need to amend the permits, the Plan, and the Implementing Agreement to include this new jurisdiction. The Habitat Plan already anticipates growth within San Martin as part of County jurisdiction. If future growth plans of a new jurisdiction of San Martin are consistent with the impacts anticipated in the Habitat Plan, a Plan amendment is expected to be straightforward. Any new jurisdiction would not be able to use the Participating Special Entity process for take coverage under the Plan.

## **8.5 Local Implementing Ordinances**

To implement the Habitat Plan on the local level, each participating jurisdiction must adopt an implementing ordinance that will reference the permits, Implementing Agreement, and Habitat Plan and the jurisdiction's obligations under the Plan. Ordinances will be considered for adoption by each jurisdiction

no later than 120 days after execution of the Implementing Agreement and issuance of the last permit by the Wildlife Agencies. A draft template for a Habitat Plan implementing ordinance is provided in **Appendix B** as an attachment to the Implementing Agreement.

The permits will be contingent upon the adoption of local implementing ordinances in Gilroy, Morgan Hill, San José, and the County. The Implementing Agreement and permits will specify that the permit is contingent upon the adoption of these implementing ordinances. This will allow the Wildlife Agencies to make a finding that the Plan is adequately funded, contingent upon the adoption of the implementing ordinances.

## 8.6 Land Acquisition

The Implementing Entity is responsible for ensuring acquisition of land for the Reserve System in accordance with the requirements in Chapter 5 (summarized in the Acquisition Actions in **Table 5-2a**). As described in Chapter 5, all land for the Reserve System must be acquired by Year 45 of the permit term. To be incorporated into the Reserve System and count toward the land acquisition requirements of the Plan, acquired lands must meet the following criteria.

- Contribute to meeting the goals and objectives of the Plan and overall success of the Habitat Plan as described in Chapter 5.
- Have a location, configuration, and quality consistent with the reserve design and assembly principles in Chapter 5, Section 5.2.3 *Reserve System*.
- Land acquired must meet multiple criteria in Chapter 5 for landscape linkages, land cover types, plant occurrences, modeled species habitat, selected wildlife species occupancy, and other land acquisition criteria.
- Permanently protect the biological functions and values that contribute to the Plan. Permanent protection must be ensured through a conservation easement consistent with the requirements of Section 8.6.3 *Conservation Easement* or by some other permanent dedication of land to the Reserve System<sup>8</sup>.
- Be managed in perpetuity according to a reserve unit management plan as described in Chapter 5, Section 5.2.5 *Land Management*. Acquisitions may be counted toward meeting the obligations of the Plan before the reserve unit management plan has been completed if the Implementing Entity owns the land or if the property owner is bound by a conservation easement or other agreement that requires preparation of a management plan consistent with the requirements of the Plan. Management in perpetuity will be ensured through the conservation easement or title record.
- Be monitored according to the requirements and guidelines in Chapter 7.

<sup>8</sup> For example, as described in Chapter 9, Section 9.4.2, up to 1,000 acres of the Reserve System may be met by incorporation of existing Open Space Authority lands that qualify as Type 1 open space. Some or all of these lands may be incorporated without conservation easements; see Section 9.4.2 for details.

- Have no hazardous materials or property encumbrances that conflict with Habitat Plan goals and objectives.
- Is not mitigation for a project or activity that is not covered by the Plan.

The land acquisition process will follow the steps listed below for land acquired in fee title or through conservation easements. All Permittees will have the opportunity to review land acquisition proposals as part of the Implementing Entity. Steps 1 through 16 apply if the Implementing Entity initiates contact with potential landowners. Steps 3 through 16 apply if a landowner contacts the Implementing Entity. These steps are also illustrated in **Figure 8-3**. The Implementing Entity could perform these steps on its own or they could be accomplished by an acquisition partner (e.g., a local land management agency).

1. Identify sites that have the potential to meet acquisition requirements for particular land cover types, plant occurrences, landscape linkages, or Conservation Analysis Zones, or to support suitable and occupied habitat for covered wildlife.
2. Approach property owner with proposal to acquire land through conservation easement or fee title.
3. If property owner is willing, secure concurrence from owner for pre-acquisition assessment of site. If a site visit is not feasible, conduct pre-acquisition assessment of site based on air photo analysis and available regional data sets (e.g., Habitat Plan data, CNDDDB, etc.).
4. Conduct necessary pre-acquisition assessment at the Implementing Entity's expense of land cover types, habitat for covered species, and presence of covered species. The Implementing Entity will develop standard protocols and a report template for pre-acquisition assessment prior to the first acquisition during implementation.
5. Determine if site meets Plan acquisition requirements. Through the due diligence process, ensure that property encumbrances (e.g., existing easements, rights-of-way, property title, resource extraction rights, presence of hazardous materials or archaeological or cultural sites) do not conflict with Plan goals and objectives. For easements, reach agreement on easement terms and any necessary management prior to purchase, where possible. Areas subject to incompatible easements or management will be excluded from the reserve system until those incompatibilities are resolved.
6. Discuss proposal to acquire property with Wildlife Agencies at a Technical Advisory Committee meeting or other venue (discussions may need to be confidential). The Implementing Entity will discuss land acquisition proposals with the Wildlife Agencies early in the process.
7. Conduct appraisal of property value (easement or fee) and water rights consistent with legal requirements for acquisition of public lands.
8. Rank available sites on the basis of cost versus ability to meet Plan requirements and biological goals and objectives. Sites that meet specific requirements, goals, and objectives that are generally difficult to fulfill should be assigned a high priority.

9. Obtain concurrence from CDFG and USFWS for all land acquisition. Wildlife Agencies have 30 days to respond to request for approval once all relevant and available information has been provided to them. If after 30 days there has been no response from an agency, the Implementing Entity will assume approval from that agency.
10. For high-ranking sites, make offer to property owner and develop easement conditions, if appropriate. Easement conditions should contain the framework of the expected management of the site that will be documented in more detail later in the reserve unit management plan.
11. Negotiate fair-market price and easement conditions, if applicable, with owner.
12. If a site is purchased in fee title, the Implementing Entity will prepare a reserve unit management plan for the site based on site conditions if the site is the first parcel in the reserve unit (see Chapter 5 for the six units). If the site is part of an existing reserve unit, the reserve unit management plan will need to be updated to incorporate the new site. If a conservation easement is purchased, the Implementing Entity will prepare a management plan with the landowner (although easement negotiations may resolve some management issues). Management plans will be consistent with the Plan's conservation strategy and the framework for adaptive management.
13. Examine all leases that apply to the property for consistency with Plan goals and objectives. Inconsistent leases may be terminated or modified to conform with the Plan. Areas subject to incompatible leases will be excluded from the Reserve System until these leases expire.
14. If acquired in fee title, assess structures and facilities on the property for hazards, covered species, and other values such as educational purposes, land management facility, or cultural or historic significance. Repair or demolish structures or facilities, as appropriate, to reduce public hazards or stabilize functions (e.g., repair of gates and fencing).
15. Initiate reserve management and monitoring according to approved reserve unit management plan.
16. Conduct habitat restoration, if applicable.

## 8.6.1 Stay-Ahead Provision

The conservation strategy of an NCCP must be implemented at or faster than the rate at which impacts on habitat or covered species occur so that conservation always stays ahead of impacts and rough proportionality is maintained between impacts on habitats or covered species and conservation measures (California Fish and Game Code 2820(b)(3)(B)). The rough proportionality standard of the NCCP Act states that

“...implementation of mitigation and conservation measures on a plan basis is roughly proportional in time and extent to the impact on habitat or covered species authorized under the plan. These

provisions shall identify the conservation measures, including assembly of reserves where appropriate and implementation of monitoring and management activities, that will be maintained or carried out in rough proportion to the impact on habitat or covered species and the measurements that will be used to determine if this is occurring” (California Fish and Game Code 2820(b)(3)(D)(9)).

Similarly, the ESA also requires that HCPs minimize and mitigate the impacts of the taking to the maximum extent practicable (ESA Section 10(a)(2)(B)(ii)). When conducting their jeopardy analyses, USFWS will consider whether the mitigation proposed is scientifically and rationally related to the impact of the taking. In order to make findings that the proposed impacts are mitigated to the maximum extent practicable, USFWS will consider temporal losses (if any) resulting from the time of impact relative to the time of mitigation.

The *Stay-Ahead provision* requires that the amount of each land cover type conserved, restored, or created by the Implementing Entity as a proportion of the total requirement for each land cover type (**Tables 5-11 and 5-13**) must be roughly proportional to the impact on that land cover type as a proportion of the total impact expected by all covered activities (**Table 4-2**). For example, if 25% of the expected impacts on mixed serpentine chaparral have occurred, then at least 25% of the required land acquisition for mixed serpentine chaparral must also have occurred.

To provide flexibility during implementation, the Implementing Entity may fall behind by a maximum of 10% of its conservation strategy requirements (conservation overall and by each applicable land cover type) and still be in compliance with the Stay-Ahead provision for this Plan. This deviation accounts for the likely pattern of infrequent land acquisition of large parcels that will allow the Implementing Entity to jump far ahead of impacts with just one acquisition. **Figure 8-4** illustrates how the Stay-Ahead provision works for land acquisition in two theoretical cases. **Figure 8-4a** shows the pattern of land acquisition required if the rate of impact occurs at a constant rate throughout the permit term. **Figure 8-4b** illustrates how conservation must occur quickly if impacts occur during the beginning of the permit term. In both cases, the Implementing Entity is allowed a 10% deviation from the required trajectory of conservation. However, once the permits end (i.e., through expiration, suspension, revocation), the Permittees will be held responsible for any outstanding requirements in the permits, Implementing Agreement, and Habitat Plan (see the Implementing Agreement for a detailed discussion).

The Stay-Ahead provision also includes a requirement for acquisition of covered plant occurrences to stay ahead of impacts to these species (**Table 5-16**)<sup>9</sup>. The Stay-Ahead provision applies to each covered plant species separately (i.e., impacts to and conservation of covered plant occurrences cannot be aggregated for purposes of Stay-Ahead).

<sup>9</sup> Exceptions to this are described for the Coyote ceanothus in Chapter 5, Section 5.4.11.

## Measurement of Stay-Ahead Provision

During the first year after permit issuance, the Implementing Entity will be establishing its structure, collecting initial Habitat Plan fees, and actively pursuing land acquisition deals with willing landowners. To allow time for these start-up tasks to occur, the Stay-Ahead provision will only apply two years after the last local ordinance takes effect. After two years of Plan implementation, the Implementing Entity must measure its compliance with the Stay-Ahead provision by the following method. To measure compliance with the Stay-Ahead provision, land cover types are aggregated by natural communities (see groupings in **Table 3-1**). The amount of each natural community conserved, restored, or created as a proportion of the total requirement by natural community must be equal to or greater than the impact on the natural community as a proportion of the total impact expected by all covered activities. For example, if 40% of the total expected impacts on oak woodland land cover types have occurred, then at least 40% of the conservation of all oak woodland land cover types must also occur. This method of aggregating land cover types only applies to the measurement of the Stay-Ahead provision (requirements for acquisition by each land cover type [Tables 5-11 and 5-12] still apply and must be met by Year 45 of the permit term or by Year 40 if restoration or creation are to occur). This aggregation method provides incentives and flexibility to the Implementing Entity to acquire, restore, or create the most sensitive and difficult land cover types first within each natural community, even if impacts to these land cover types have not yet occurred.

Land acquired or funded in full or in part by state or federal agencies to contribute to species recovery under this Plan will also contribute to compliance with the Stay-Ahead provision. A portion of the Plan assumes funding by the state and federal governments. The Implementing Entity must recognize, however, that funds from public agencies will be available on budget cycles, and subject to administrative processes, that may or may not correspond to the timing of covered activities. Therefore, the Implementing Entity must acquire land and implement other conservation actions on its own and cannot rely on the timely availability of state or federal funds to implement these actions.

The Implementing Entity will monitor the status of the Stay-Ahead provision throughout Plan implementation. The Stay-Ahead provision will also be evaluated on an annual basis by the Wildlife Agencies. Beginning with the Year 2 annual report, the Implementing Entity will report on the status of the Stay-Ahead provision. As long as the pace of conservation measure implementation (i.e., preservation, restoration, or creation) does not fall behind the pace of covered activity impacts by more than 10% , the Stay-Ahead provision will have been satisfied.

If the Plan is found to be out of compliance with the Stay-Ahead provision, the Wildlife Agencies will determine if the Plan has maintained rough proportionality. If any of the Wildlife Agencies issue a notification to the Implementing Entity that rough proportionality has not been met, then the Wildlife Agencies and the Implementing Entity will meet to develop a plan to remedy the situation.



## Land Acquisition and Restoration Credit

The criteria for incorporating land into the Reserve System are described above. Land may be counted toward Plan requirements and the Stay-Ahead provision once it is incorporated into the Reserve System and if the lands are compatible with Plan goals and objectives. Infrastructure described as part of the Reserve System in Section 2.3.8 *Conservation Strategy Implementation* is assumed to be compatible with the Plan goals and objectives if it is implemented consistent with the conditions on covered activities described in Chapter 6, including Condition 9 *Prepare and Implement a Recreation Plan*. Existing and newly constructed infrastructure within the Reserve System does not count toward land cover type land acquisition requirements described in Chapter 5, but it does count toward the total Reserve System size requirements.

Compliance for land cover types for which restoration or creation are required will be measured when construction is completed. However, if the project fails to meet the success criteria developed during implementation for each site, the compliance credit will be revoked.

The Implementing Entity will receive credit for existing wetland land cover types that are part of the Reserve System except where wetland functions are degraded by their proximity to urban development. The thresholds for wetland preservation credit are described in Chapter 5 and in **Table 5-15**.

A key requirement of the land acquisition strategy is landscape connectivity and connections to existing open space. Land acquired early in the permit term may be isolated from existing open space until future acquisitions can connect it. Such acquisitions are eligible for credit under the Plan and for the Stay-Ahead provision. If it is clear later in the permit term that land acquired, in part, for connectivity purposes cannot be connected to existing Types 1–3 open space, compliance credit under the Plan will be revoked for the linkage requirement (other credit will remain).

Any rights-of-way or utility easements that are maintained or used regularly cannot be credited towards land acquisition requirements because of the disturbance that occurs within these areas. It is the responsibility of the Implementing Entity to document the frequency and type of use in these rights-of-way or easements to justify whether land acquisition credit should be applied in these areas.

Land cover restored or created can receive credit for restoration or creation and preservation (see Chapter 5 for land cover restoration and creation requirements, and how credit is applied). If the restoration/creation project occurs after recordation of the conservation easement (i.e., after preservation credit is assigned), the acreage of the restoration/creation project will be subtracted from the preserved land cover types that the project replaces. For example, a site that supports 100 acres of annual grassland is preserved by the Implementing Entity. When the conservation easement is recorded, the Implementing Entity receives 100 acres of annual grassland credit towards the preservation requirements of the Plan. Five years later, a 1-acre pond is created on the site. When the pond

restoration project is completed (i.e., when construction is complete), 1 acre is subtracted from the annual grassland preservation credit for the site and applied to pond creation and preservation.

The Implementing Entity must document the conditions of the restoration site prior to initiating restoration in order to determine whether the project is enhancing or restoring the wetland according to the definitions in the Plan (see **Appendix A**). If the site is being enhanced, then only preservation credit can be applied. If the site meets the definition of restoration, then restoration and preservation credit can be applied.

Wetland restoration credit may change if the wetland type changes (e.g., a pond becoming a perennial wetland if cattails colonize and dominate the site) before success criteria are met. Final restoration and creation credit will be determined once the success criteria of the restoration project are met. In no cases will the total amount of credit exceed the ground area present.

The Plan makes sharp distinctions between some land cover types when, in reality in the field, there are often gradual gradients between land cover types. In cases where it is difficult to draw a boundary between land cover types, a qualified biologist or botanist will identify each land cover type based on field conditions and professional judgment.

## Stay-Ahead Reporting and Process for Addressing Deficits in Land Conservation

The Implementing Entity will report the status of the Stay-Ahead provision in each annual report, beginning with the second annual report. If the Stay-Ahead provision is not met, the Implementing Entity and the Wildlife Agencies will meet and confer within 30 days of the annual report to assess the situation and develop and implement a mutually agreeable plan of action as described in the land acquisition actions (see Section 5.3.1 *Land Acquisition and Restoration Actions* in Chapter 5) and the Implementing Agreement to remedy the situation and achieve compliance with the Stay-Ahead provision. The mutually agreeable plan of action may include a range of potential solutions, including those listed below.

- Wait for key pending land acquisition deals to close that will bring the Plan into compliance with the Stay-Ahead provision.
- Speed delivery of funding sources or partnerships that will enable more land acquisition to bring the Plan into compliance with the Stay-Ahead provision.
- More aggressively solicit interest from key landowners who may be willing to sell land to the Implementing Entity that would enable compliance with the Stay-Ahead provision.
- Change the manner in which the Plan is implemented such as more direct acquisition of land by the Implementing Entity rather than relying on partnerships, shifting the Implementing Entity's budget allocations to place a

higher priority on land acquisition, or accelerating the process for being able to count land already acquired against Stay-Ahead requirements by, for example, recording easements more quickly.

- Require that project proponents provide land in lieu of fees (see below).
- Temporarily or permanently adjusting certain Plan provisions through an amendment or other process (e.g., the method for measuring compliance with the Stay-Ahead provision), with the approval of the Wildlife Agencies.
- Slowing or stopping take authorizations until conservation strategy obligations catch up with impacts.
- If, after the exercise of all available authority and utilization of all available resources, the Implementing Entity cannot comply with the Stay-Ahead provision, the Plan will be reevaluated, and an amendment may be warranted if adjustments to the take authorization, permit term, conservation obligations, or other aspects of the permits, Implementing Agreement, or Plan are necessary. See below for more information on the land in lieu of fee requirement when the Stay-Ahead provision is not being satisfied or is at risk of not being satisfied.

## **Requirements for Providing Land Instead of Paying a Fee When Stay-Ahead Provision Is Not Being Met**

If the Implementing Entity determines the Plan is at risk of noncompliance with the Stay-Ahead provision, the Implementing Entity will notify the Permittees. The Implementing Entity may determine that it is necessary to temporarily require project proponents (including Permittees) to provide land (or perform equivalent conservation actions in Chapter 5) instead of paying a fee. However, if the Stay-Ahead provision is not satisfied based on the criteria discussed above, the Implementing Entity must notify the other Permittees that it is necessary to temporarily require project proponents to provide land instead of paying fees, unless the Wildlife Agencies agree, after conferring with the Implementing Entity, that a different plan of action developed in concert with the Implementing Entity will remedy the situation and it is not necessary to require project proponents to provide land instead of paying a fee. Alternatively, a Permittee may have accrued sufficient credits to offset any fees due.

If the Wildlife Agencies determine the Plan is at risk of noncompliance with the Stay-Ahead provision, they will so notify the Implementing Entity in writing, and the Implementing Entity and Wildlife Agencies will meet to develop a mutually agreeable plan of action that will fulfill such requirements. If the Wildlife Agencies determine that the requirements of Section 8.6.1 *Stay-Ahead Provision* have not been fulfilled, they may, by written notice to the Implementing Entity, require it to initiate the requirement to dedicate land in-lieu of fees.

Land will be provided to the Implementing Entity according to the guidelines and criteria in Section 8.6.7 *Land Dedication In Lieu of Development Fee*. Project proponents will always have the option of providing land in lieu of the base

development fee as long as the land offered meets the criteria in Section 8.6.7 *Land Dedication In Lieu of Development Fee*. If the Implementing Entity initiated the requirement due its own determination that the Plan was at risk of noncompliance, the requirement to provide land instead of a fee will be lifted (i.e., it will revert back to an option) as soon as the Implementing Entity determines that it is no longer at risk of noncompliance with the Stay-Ahead provision. If the Implementing Entity or Wildlife Agencies initiated the requirement following noncompliance with the Stay-Ahead provision, the requirement will be lifted as soon as the Implementing Entity demonstrates in writing to the satisfaction of the Wildlife Agencies that the Plan is in compliance with the Stay-Ahead provision.

## Conservation Action Deadlines Beyond Stay-Ahead Requirement

As summarized above, the Implementing Entity is required to meet the Stay-Ahead provision so that land acquisition keeps pace with impacts. However, if impacts occur more slowly than expected, strict adherence to the Stay-Ahead provision would result in relatively slow growth of the Reserve System initially, followed by a rapid expansion of the Reserve System in order to meet the final acquisition targets. To ensure that the Implementing Entity makes steady progress towards the final land acquisition targets, in year 20 of implementation, the Implementing Entity will work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System. To ensure that the Implementing Entity makes steady progress towards final restoration/creation goals, interim deadlines are established in **Table 5-14** for each watershed in the study area. Section 5.3.6 *Riverine and Riparian Forest and Scrub Conservation and Management* also includes deadlines for riverine acquisition and restoration. The Stay-Ahead provision described above must always be followed.

Chapter 5 also establishes deadlines for conservation actions not related to land acquisition or habitat restoration/creation such as wildlife connectivity studies. See Chapter 5 for these additional deadlines that go beyond the Stay-Ahead requirement for land acquisition.

## Rough Proportionality and Stay-Ahead for the Burrowing Owl Conservation Strategy

The Stay-Ahead requirement for the western burrowing owl conservation strategy is unique because the strategy includes a combination of land acquisition, conservation actions, and management agreements over 5,300 acres<sup>10</sup> of occupied and potential nesting habitat by Year 45. This requirement only applies to occupied and potential nesting habitat (not overwintering only habitat) because these two habitat types are the most critical in meeting the conservation

<sup>10</sup> 600 acres of the 5,300 acres must be permanently protected occupied nesting habitat.

strategy goal of increasing the adult burrowing owl population by three birds per year. The Stay-Ahead requirement for burrowing owl will be applied similar to the Stay-Ahead provision for the Reserve System as a whole, but the calculation will be based on acres of modeled occupied and potential nesting habitat either preserved or managed instead of acres of natural communities preserved. Although temporary management agreements can count toward the burrowing owl Stay-Ahead provision, all management agreements (up to 4,700 acres) must be permanent by Year 45. In addition, managed or permanently protected occupied nesting habitat must remain within 10% deviation of permanent impacts to occupied nesting habitat based on a 3:1 ratio (management or protection to impacts). For example, if 50 acres of permanent impacts to occupied nesting habitat have occurred, then 150 acres of occupied nesting habitat must be under a management agreement or permanently protected.

In addition, to account for the conservation actions that will be applied and to provide an incentive to implement them quickly, the Implementing Entity may credit another 5% of the Stay-Ahead requirement against implementation of conservation actions on managed lands. Together with the allowable 10% deviation, this provides up to a 15% allowance in meeting Stay-Ahead for western burrowing owl. For example, if 66 acres of the 198-acre impact cap for this species has been used (33%), then 1,767 acres (33% of 5,300 acres) must be under management agreement for this species. If necessary, this requirement could be reduced to 1,219 acres (23% of 5,300) to account for 10% allowable deviation. If conservation actions are being successfully applied as determined through consultation with the Wildlife Agencies, the Stay-Ahead requirement for management agreements could be reduced by up to another 5%, to 954 acres (18% of 5,300 acres).

## 8.6.2 Land Acquired by Other Organizations or through Partnerships

It is anticipated that substantial amounts of land for the Reserve System will be acquired by Permittees such as County Parks. SCVWD may also acquire land for the Reserve System. Land that meets the terms of the Plan would be credited towards land acquisition requirements in Chapter 5. In other instances, agencies and organizations who are not Permittees such as the Open Space Authority or local land trusts (e.g., The Nature Conservancy, Peninsula Open Space Trust) will acquire land in the study area that will help meet the goals and objectives of this Habitat Plan. In these cases, it may be appropriate that the Implementing Entity receive credit toward Plan requirements if the acquisitions are made in partnership with the Implementing Entity, they are consistent with Plan goals, and the lands are enrolled into the Reserve System through placement of a conservation easement. It is expected that the Implementing Entity will be involved in many of the land acquisitions in the study area during the permit term. However, the Implementing Entity may own little or no land itself. For example, if the Implementing Entity partners with other groups and provides matching funds, larger land acquisitions will be possible than if the Implementing Entity were to purchase the land on its own. Land acquired through partnerships

with non-Permittees can be counted toward the Habitat Plan conservation requirements (i.e., contribution to recovery) only if the acquisition meets the criteria for Reserve System lands described in Chapter 5 and the criteria described above in Section 8.6 *Land Acquisition*.

Credit will be determined based on the purpose and location of the acquisition, the management of the land acquired, and consistency with the conservation strategy of the Habitat Plan. The Plan budget assumes that the Implementing Entity will always fund management and monitoring on land in the Reserve System; actual funding will be determined on a case-by-case basis. Land acquired through partnerships could be managed and monitored by the Implementing Entity or by other groups or agencies as long as a contract or other binding agreement is in place to ensure that management and monitoring occurs according to the terms of the Plan. Land acquired with state or federal money will be credited toward the state/federal contribution discussed in Section 9.4.3 *State and Federal Funding* (Chapter 9). All acquisitions credited toward the land acquisition requirements of the Plan can be credited toward the Stay-Ahead provision as discussed in Section 8.6.3 *Conservation Easements* above, regardless of who manages the property and regardless of the source of funding for acquisition or management.

## Land Acquisition during Plan Development (Interim Conservation)

Open space agencies and organizations in the study area have been acquiring land during Habitat Plan development. Consistent with the NCCP Act Section 2810(b)(8) and the Planning Agreement, parcels or portions of parcels acquired after approval of the Planning Agreement (October 2005) can be counted toward meeting Plan requirements according to the procedures and criteria described above for lands acquired by other organizations or through partnerships. In addition, lands acquired during Plan development can only be credited against Plan requirements to the extent the land is acquired without mitigation funds. If an acquisition occurs using some mitigation funds, only that portion of the acquisition funded by non-mitigation funds can be credited towards the Plan. The Implementing Entity may expend funds to augment management of these interim purchases if the augmentation is necessary to provide credit toward Plan land acquisition requirements.

Lands acquired during Plan development that may be counted toward Plan requirements must meet the criteria outlined in Section 8.6 *Land Acquisition* above. Likely interim land acquisitions are listed in **Table 5-5** and shown **Figure 5-4**. Other lands conserved during Plan development may not appear in **Table 5-5** or **Figure 5-4** if the conservation action took place during production of the final Habitat Plan or if preparers of the Plan were not aware the property had been conserved. Such lands may be counted toward Plan requirements using the same criteria described in this section.

## Private Mitigation Banks

A mitigation bank is privately or publicly owned land that is managed for its natural resource values. Mitigation banks may sell species credits, wetland credits, or both. The bank sells credits to private or public project proponents to offset their impacts, and the money is used to improve and maintain the resources. Conservation banks must be approved by USFWS and CDFG (and the Corps if the bank is also selling jurisdictional wetland credits). In exchange for permanently protecting the land, the bank operator is allowed by the Wildlife Agencies to sell species credits to developers who need to satisfy legal requirements for compensating for the impacts of projects that affect listed species or their habitat<sup>11</sup>. A conservation or mitigation bank is a free-market enterprise that performs the following functions.

- Offers landowners economic incentives to protect natural resources.
- Saves project proponents' time and money by providing them with the certainty of preapproved compensation lands.
- Provides for long-term protection and management of habitat.
- The goals of private mitigation banks are similar to those of regional HCPs or NCCPs, including this Plan.

Credits sold by private mitigation banks within the permit area can count toward the Habitat Plan if they are consistent with the conservation, monitoring, adaptive management, and other relevant provisions of the Plan. For the bank to be eligible to sell credits to project proponents (public or private) with activities covered by the Habitat Plan, the bank must meet all of the relevant standards of habitat enhancement, adaptive management, and monitoring outlined in Chapters 5 and 7. All impacts and mitigation for impacts covered under the Habitat Plan must occur within the permit area analyzed in USFWS's biological opinion for the Habitat Plan. Similarly, CDFG policy requires all impacts and mitigation to occur within the permit area. As such, mitigation banks located outside of the permit area may not be used.

Mitigation bankers wishing to establish a bank whose credits can count toward Habitat Plan requirements must notify the Wildlife Agencies to allow consideration of such provisions during bank development and agency approval. Bankers must also coordinate closely with the Implementing Entity to help ensure the bank's consistency with the Habitat Plan and use by Habitat Plan Permittees.

There are currently no approved conservation or mitigation banks in the study area. A bank near Gilroy on Lucky-Day Ranch is currently being proposed to USFWS and CDFG. There are several banks in adjacent counties whose service area extends into the study area. Credits sold by banks located outside the permit area cannot count toward Plan goals or Plan fees even if the bank's service area extends into the permit area.

<sup>11</sup> For additional information on banking see: [www.dfg.ca.gov/hcpb/conplan/mitbank/mitbank.shtml](http://www.dfg.ca.gov/hcpb/conplan/mitbank/mitbank.shtml).

### 8.6.3 Conservation Easements

Conservation easements will be used as an important tool in Plan implementation in three ways:

- Conservation easement placed on land or watercourses acquired in fee title by the Implementing Entity or one of its land acquisition partners to secure credit under the Plan (see Section 8.6 *Land Acquisition*).
- Conservation easement purchased from a private party and placed on the land or water still owned by the landowner (i.e., as an alternative to fee title acquisition).
- Conservation easement placed on land or water in public ownership at the time of permit issuance.

This section describes the process for developing acceptable conservation easements in all three cases. These guidelines and rules will be used by the Implementing Entity or by its partners acquiring conservation easements on behalf of the Implementing Entity with Habitat Plan funding.

All conservation easements acquired to meet the goals of the Habitat Plan will be in perpetuity and in accordance with California Civil Code Sections 815 et seq.<sup>12</sup> as well as the current policies of the Wildlife Agencies. All conservation easements will be voluntarily offered by the holder of the underlying fee. The conservation easements will be dedicated to the Implementing Entity or to another conservation organization (e.g., California Rangeland Trust, The Nature Conservancy) if that organization is approved by the Implementing Entity, the Wildlife Agencies, and the landowner. In addition, a binding agreement must exist between the Implementing Entity and the easement holder to ensure compliance with the permits, Implementing Agreement, and Plan. An objective of the easements is to have consistency in enforcement, monitoring, and maintenance. Conservation easements on land owned by the Implementing Entity must be held by another conservation organization.

USFWS and CDFG will be named as third party beneficiaries on all conservation easements. To ensure compliance with the Plan, all conservation easements will follow the template easement in **Appendix H** as close as is reasonably possible. Reasonable variations from the template may be needed to address site-specific constraints. CDFG and USFWS, along with the Implementing Entity, must review and approve any modifications to the template easement.

It is the responsibility of participating landowners to abide by the terms of these conservation easements. The terms and prices of conservation easements will be negotiated on a case-by-case basis between the landowner and the Implementing Entity. The specific terms of the conservation easement will be developed on a case-by-case basis depending on site conditions, landowner preferences and operations, and species and habitat needs. Some landowners may wish to reserve

<sup>12</sup> This section of California law allows placement of restrictions on the use of land for conservation purposes that is binding on all successive owners of that land.



a portion of their property for uses that are incompatible with the Habitat Plan such as a home site or a recreational facility with high intensity use. In these cases, the conservation easement may either exclude the incompatible site or apply to the entire property but define the portion of the site in which the incompatible uses are allowed<sup>13</sup>. The Habitat Plan will only receive credit for the portion of the property that is compatible with Plan goals and objectives.

Each conservation easement for the property or portion of the property that will be incorporated into the Reserve System will be drafted to:

- ensure that the property will be kept in its natural or existing condition (all or portions of the site may also be enhanced or restored),
- protect the existing, enhanced and/or restored conservation values of the property forever,
- ensure that the easement cannot be extinguished without the prior written consent of the Implementing Entity and the identified third party beneficiary Wildlife Agencies,
- confine the allowable uses of the property to those activities that do not interfere with the preservation or enhancement of those conservation values consistent with the Plan, and
- prevent any use of the property that would impair or interfere with the conservation values of the property.

The conservation values will be specifically described in terms of covered species and their habitat, as well as other land cover types and natural communities on the property. Conservation values will be described, at a minimum, using the land cover types and covered species habitat described in Chapter 3 and **Appendix D**. A legal description and map must be included in the easement.

Each conservation easement will prohibit certain activities as described in the Template Conservation Easement (**Appendix H**), except as necessary to meet the biological goals and objectives of the Plan (including infrastructure required to support monitoring, management, and maintenance) or to provide recreational services consistent with the Plan (see Chapter 6, Section 6.4.6, subheading *Condition 9. Prepare and Implement a Recreation Plan*). These allowances will be described in the reserve unit management plan that will be developed by the Implementing Entity. In addition, all recorded conservation easements must include or incorporate by reference the items listed below.

- The initial pre-acquisition assessment of covered species habitat and natural communities present.
- A detailed list of the allowable uses and use restrictions on the parcel, consistent with the minimum requirements stated above.

<sup>13</sup> There may be advantages to having the conservation easement apply to the entire site, for example, to avoid costly boundary surveys needed to define the conservation easement more narrowly than the property boundary.

- Any mandatory terms and conditions to maintain or enhance the habitat pursuant to Section 5.2.5 *Land Management* of this Plan.
- Provisions for access by the Wildlife Agencies and the Implementing Entity or its designee to monitor compliance with the terms of the conservation easement and to carry out all applicable management and monitoring requirements described in Chapter 5 and Chapter 7, respectively.
- The allowances or restrictions on public access and recreation on the site, compatible with the conservation goals of the Plan, *Condition 9 Prepare and Implement a Recreation Plan for each Reserve Subunit* in Chapter 6, Section 6.4.6, and landowner wishes.
- Conservation easements on grazing lands will describe the general nature of the grazing to be allowed. The easement will specify the desired vegetation and other habitat conditions and, if necessary, impose limits on the timing, stocking density, and duration of permitted grazing to meet those conditions. These desired conditions and grazing limitations will be allowed to fluctuate according to the adaptive management process. A baseline condition will be described to provide a benchmark to measure habitat enhancement on the site. The conservation easement may accomplish this requirement by reference to a separate reserve unit management plan prepared for the lands covered by the easement.
- The conservation strategy does not call for acquisition of cultivated agricultural land. However, conservation easements on cultivated agricultural land may accompany acquisitions that primarily service other strategic objectives. If cultivated agricultural land is acquired, the conservation easement will ensure that the land meets one or more biological goals and objectives of the Plan. If the site contains aquatic or riparian habitat that supports or could support covered species, the conservation easement will also generally describe measures to maintain or enhance those habitats. The conservation easement may accomplish this requirement by attaching or referencing a separate reserve unit management plan prepared for the lands covered by the easement. Alternatively, if the reserve unit management plan is prepared later, it may contain additional detail on site enhancement.
- Conservation easements will take into account issues of water use efficiency and runoff into adjacent or nearby streams and their potential effects on covered species, if applicable.
- Provisions for enforcement and available remedies for the Implementing Entity or appropriate other party in the event that title holder or third party violates the terms of the conservation easement.
- If the easement boundaries are different from the parcel boundaries, a legal description and map will accompany the easement.
- When a reserve unit management plan is prepared for private property according to Section 5.2.5 *Land Management*, the Implementing Entity will record a Memorandum of Unrecorded Reserve Management Plan, indicating where that reserve unit management plan may be found and that the terms of such reserve unit management plan will be followed. Such a title record

ensures that the reserve unit management plan will be tied to the conservation easement in the event property ownership changes. The title record also ensures management of the site in perpetuity.

To approve and accept a conservation easement, the Implementing Entity must have the following documentation.

- A pre-acquisition assessment of the property summarizing the baseline biological conditions including the presence and condition of natural communities and the presence and condition of covered species, if known (a complete biological inventory of the site would be conducted after the easement is recorded).
- A preliminary title report and legal description of the property.
- Assurance that any superior liens or interests will not substantially conflict with the property's conservation values.
- Evidence of all other easements, covenants, restrictions, reserved rights, and other property interests (including water rights).
- A clean Phase I environmental analysis for hazardous materials.
- A map and description of the parcel and its physical condition (e.g., roads, buildings, fences, wells, other structures) and its relation to other components of the Reserve System and other properties subject to other permanent protections for conservation purposes.
- A Property Analysis Report (PAR) or comparable assessment of the initial capital costs and ongoing management funds required to manage and monitor the lands (e.g., applicable components of Habitat Plan cost estimate).

## Easements on Land Acquired by or for the Implementing Entity

As described in Section 8.6 *Land Acquisition*, the Implementing Entity must secure permanent protection of a property in order to receive credit under the Plan. If the land is owned by the Implementing Entity or a Permittee, a conservation easement must be placed on the site to ensure permanent protection. For lands acquired for the Reserve System but owned by other public entities, permanent protection must also be ensured by a conservation easement consistent with the requirements of Section 8.6.3 *Conservation Easements*. In either case, conservation easement terms will be consistent with those described in this section.

## Easements on Private Land

This Plan assumes that the Implementing Entity and its partners will purchase some of the land for the Reserve System in conservation easements rather than in fee title. For example, conservation easements are appropriate where landowners

wish to remain on the property and the Plan's conservation goals can still be met with an easement. Conservation easements have been used throughout California to preserve farms, ranches, and the working landscapes that they support. The conservation easements purchased by the Habitat Plan Implementing Entity are intended to preserve the natural features of a property. However, as a secondary benefit, these easements are also expected to protect working landscapes of all kinds throughout the study area. Only portions of properties that meet one or more of the goals of the Plan will be credited to the Plan as part of the conservation strategy. In some cases, an easement may be placed over more of a property than initially credited with the hope that other portions of the property may be restored or enhanced to accommodate Plan goals in the future. Additional credit may be applied to these other sites once they meet Plan goals.

Some ranchers may prefer selling a conservation easement to selling their land in fee title so they can remain on their land and continue to conduct livestock operations. Livestock grazing will be an important management tool in the Reserve System (see Chapter 5), so this use is likely to be compatible with the conservation goals of Plan and therefore suitable for conservation easements.

## Easements on Existing Public Lands

As described in Chapter 5, one component of the conservation strategy is to enhance the management and monitoring of high-value sites on existing public lands within County Parks and the Open Space Authority (**Table 5-5**). The Habitat Plan will provide additional funds or staff to these agencies to perform specific management and monitoring tasks in selected park units that will substantially benefit the covered species and natural communities. To ensure that these sites will be managed in perpetuity to benefit the covered species, the Plan proposes permanent conservation easements that allow recreational uses compatible with the conservation strategy of the Plan on approximately 12,000 acres of the County park lands identified and described in **Table 5-5** and illustrated in **Figure 5-4**. These sites will be enhanced to support the Habitat Plan and will be incorporated into the Reserve System.

Credit will be applied to the Habitat Plan once sites on existing public lands are placed under a conservation easement or other permanent dedication that is consistent with the easement requirements described in this section.

### 8.6.4 Grazing Leases, Licenses or Contracts within the Reserve System

Livestock grazing is an important management tool that benefits some terrestrial covered species. As a result, managed livestock grazing is expected to be used extensively in the Habitat Plan Reserve System. Existing grazing leases or

licenses<sup>14</sup> on a newly established reserve acquired in fee title will continue until a reserve unit management plan is prepared and approved by the Implementing Entity and the Wildlife Agencies. After the reserve unit management plan is approved, all grazing leases or licenses on the reserve will be reviewed by the Implementing Entity for consistency with the reserve unit management plan and with the terms of the Habitat Plan. If necessary, leases or licenses will be revised and brought into compliance with the Plan's conservation strategy and the framework for adaptive management to the extent allowable by the terms of the lease. Areas covered by incompatible leases will be excluded from the Reserve System until the incompatibilities are resolved. If land is acquired in fee title from a landowner who is also the grazing operator, the Implementing Entity will maintain the previous grazing regime with a willing former landowner (e.g., through a short-term lease) until a reserve unit management plan is prepared and approved by the Implementing Entity and the Wildlife Agencies. Once approved, this reserve unit management plan will establish the grazing regime on the site, which can then be incorporated into long-term grazing leases.

If livestock grazing is introduced to a reserve acquired in fee title or if the preexisting grazing lease or license expires, the Implementing Entity or other Permittee agency (e.g., County Parks) will enter into a lease agreement or license with the livestock operator. A contract may be necessary in the event that the livestock operator is paid by the Implementing Entity to graze livestock (e.g., when grazing a small site or using a prescription that does not provide an economic return to the operator). The contract, lease agreement, or license will specify the desired vegetation and other habitat conditions and impose limits on the timing, stocking density, and duration of permitted grazing to meet those conditions. Grazing contracts, leases, or licenses will be reviewed annually with the operator to adjust grazing practices to best meet habitat goals. At the expiration of the contract, lease, or license, the Implementing Entity will review monitoring data to determine whether the contract, lease, or license should be reissued with no changes in grazing management, reissued with changes in the grazing regime, or not reissued. All new and renewed contracts, leases, or licenses will include the following conditions of agricultural use and covenants to protect resources.

- Grazing capacity and stocking rates.
- Evaluation of fencing of riparian areas.
- Residual dry matter guidelines.
- Conditions under which the desired stocking rate can be changed or exceeded (e.g., seasonal adjustments to maintain habitat quality, annual adjustments in response to rainfall).
- Grazing and livestock practices.
- Pest control restrictions.
- Reporting requirements.

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<sup>14</sup> A lease is a short- or long-term contract for use of a property, whereas a license is a short-term permit allowing use under an established program. Both leases and licenses may be applicable to livestock grazing in the study area.

The lease agreement will also outline the responsibilities of each party for maintaining reserve infrastructure (e.g., fences, watering facilities). In addition to maintenance of reserve infrastructure, lease agreements will also include the responsibilities of the grazing lessee to maintain or meet desired habitat conditions. Responsibilities of the grazing lessee may include, but are not limited to:

- Fence repair and maintenance;
- Weed control, including any necessary herbicide application;
- Feral pig management; and
- Pond maintenance.

Other maintenance actions may be included in the lease agreements if deemed appropriate by the Implementing Entity. Costs to perform these actions are included in the cost model assumptions (see Chapter 9, and **Appendix G**).

## 8.6.5 Willing Sellers

A key principle of the Habitat Plan is that land will only be acquired by the Implementing Entity for the conservation strategy from willing sellers. This principle will be strictly followed; the Implementing Entity will not condemn land from unwilling sellers in order to meet Plan conservation requirements. Likewise, the Implementing Entity will not partner or contract with a separate agency to condemn land from unwilling sellers for the Habitat Plan, nor will it contribute funding toward a condemnation from an unwilling seller.

Nothing in the Habitat Plan will prevent other organizations from exercising their powers of eminent domain for purposes other than implementation of the Habitat Plan and with funds other than those raised as a result of this Habitat Plan. If subsequent to such a condemnation, and after soliciting input from the Public Advisory Committee, the Implementation Board of the Implementing Entity finds that the condemned lands are integral to the successful implementation of the Habitat Plan, the Implementing Entity may seek agreement with the owner of the condemned lands to manage those lands in a manner consistent with the Habitat Plan.

Given the many land acquisition requirements in Chapter 5 (see Section 5.3.1 *Land Acquisition and Restoration Actions*), it is possible that one or several landowners who own key resources of interest to the Implementing Entity will refuse to sell, or that negotiations to sell will fail. It is impossible to predict at this time where this may occur and in what context it will occur (e.g., how much of the Reserve System has been acquired, the extent of resources remaining to protect). This situation, if it occurs, is only expected near the end of Year 45, when all land acquisition requirements must be met. By this time, most or all of the development impacts will likely have occurred; consequently, any delays in land acquisition associated with a lack of willing sellers will affect few covered activities. This situation can be avoided if the Implementing Entity begins negotiations with key landowners early in the permit term. A review of progress

toward land acquisition goals will take place at least annually with each annual report submitted to the Wildlife Agencies.

If key landowners are not willing to sell, the Implementing Entity, in coordination with the Wildlife Agencies, will reconfigure the land acquisition strategy to ensure that the biological goals and objectives will be achieved and that the total extent and type of lands to be preserved under the Habitat Plan will be acquired. If such a reconfiguration is not possible, the options below will be considered.

- Requiring project proponents to provide land instead of fees to obtain coverage under the Plan (see Section 8.6.7 *Land Dedication In Lieu of Development Fee*).
- Slowing or stopping local permit issuance under the Habitat Plan until key land acquisitions can be made.

## 8.6.6 Gifts of Land

The Implementing Entity may accept land (or other conservation actions) as a gift or charitable donation. The Implementing Entity will evaluate the conservation benefit of the lands donated relative to the goals, objectives, and requirements of the Habitat Plan. Donated land that does not meet these goals, objectives, and requirements may be sold or exchanged to enable acquisition of land that does meet these goals, objectives, and requirements.

## 8.6.7 Land Dedication In Lieu of Development Fee

Private landowners or Permittees (i.e., project proponents) may own land that can help to meet the conservation goals of the Plan. Project proponents that own land within a priority conservation area (**Figure 5-8**) may wish to transfer fee title or place a conservation easement on the portion of their property within the Plan's conservation areas. If approved by the Implementing Entity and Wildlife Agencies, this transfer or easement dedication can reduce or eliminate the land cover, serpentine, burrowing owl, and/or temporary impact fees required for development of the remaining portion of the property. Some project proponents who wish to develop parcels may own other parcels within an area targeted for conservation by the Plan. Transferring title or dedicating a conservation easement on the site within the target conservation area could eliminate or substantially reduce some of the development fees to develop the other property. Alternatively, project proponents may prefer to acquire their own mitigation lands within target conservation areas and transfer title of these lands or dedicate easements on them to the Implementing Entity instead of paying all or a portion of the development fees. This section describes the process for allowing these situations.

Land cannot be provided in lieu of any required wetland fees. However, project proponents may implement their own wetland restoration or creation project in

lieu of all or a part of wetland fees. See Chapter 9, Section 9.4.1, subheading *Aquatic Restoration or Creation Provided in Lieu of Wetland Fee* for details.

## Criteria for Providing Land In Lieu of Development Fees

Land will be eligible for land cover, serpentine, burrowing owl, and/or temporary impact fee credit if the land satisfies the criteria below.

- The land satisfies the criteria for Reserve System lands in Chapter 5 and as summarized in Section 8.6 above.
- The land is within an area designated as high or moderate priority for acquisition (see Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Actions* and **Figure 5-8**), or the unique and high values on the site justify its inclusion in these designated areas.
- The transaction is approved for the Reserve System by the Implementing Entity and the Wildlife Agencies, consistent with their review and approval authority over all land acquisitions for the Reserve System (see Section 8.6 *Land Acquisition*, Step 9).

Project proponents are encouraged to provide to the Implementing Entity baseline data on their offered properties that document their biological value to the Plan. Documentation should explain how the site meets land acquisition requirements and biological goals and objectives. However, the property owner must provide access to the proposed site to allow Implementing Entity staff or their designees to survey the site and verify its biological value for the Reserve System. If needed, surveys would be performed at no cost to the project proponent. The Implementing Entity should also consult local land managers when evaluating land in lieu proposals to help determine long-term management and monitoring issues, feasibility, and costs. The project proponent will pay the cost of other due diligence such as Phase 1 site assessment, appraisal, and title search.

The Implementing Entity will consider requests for a development fee reduction or waiver in exchange for land dedication (title transfer or conservation easement) on a case-by-case basis. The amount of the development fee reduction will be assessed according to the criteria provided in Chapter 9, Section 9.4.1, subheading *Criteria for Determining Fee Credit for Land Provided in Lieu of Development Fees*.

## Stream Setbacks

As described in Chapter 6, Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks*, covered projects that occur adjacent to streams and riparian areas are required to establish setbacks from these resources. Landowners will not pay fees on the portion of their parcels that are dedicated as stream setbacks



(see Chapter 9 for details on required fees or fees waivers). In some cases, stream setback dedications may be suitable for inclusion in the Reserve System and therefore may be able to offset all or a portion of the development fee outside of the setback. To qualify for inclusion in the Reserve System, stream setbacks must be placed in a conservation easement according to the requirements in Section 8.6.3 *Conservation Easements* above. In addition, lands must meet the criteria described above for land in lieu of development fees.

## 8.6.8 Williamson Act Parcels

The California Land Conservation Act of 1965, or Williamson Act, established the state's primary program for the retention of private land in agriculture and open space use. The Williamson Act is a voluntary program that offers reduced property taxes on lands that have enforceable restrictions on their use via contracts between individual landowners and local governments. Each of the participating jurisdictions administers the Williamson Act program in their jurisdiction. According to data from Santa Clara County, 219,757 acres within the study area are currently under Williamson Act contracts. Williamson Act lands in unincorporated portions of the study area are found in the Santa Cruz Mountains, Diablo Range, and in the Santa Clara Valley floor in and near Morgan Hill and Gilroy.

A majority of the land anticipated to be part of the Reserve System is currently subject to Williamson Act contracts. The preservation of open space is consistent with Williamson Act contracts. However, the intention of these contracts is to preserve agriculture (livestock grazing or cultivated crops) on private lands. If the Implementing Entity acquires lands subject to Williamson Act contracts, the Implementing Entity is expected to allow these contracts to lapse at the end of their 10-year term (i.e., file for non-renewal). Alternatively, the Implementing Entity could apply to the County to convert the contracts to Open Space Easement Agreements pursuant to California Government Code 51255 through an existing County program. Such conversions would be subject to approval by the County Board of Supervisors.

## 8.7 Roles and Responsibilities in Reviewing Applications for Take Authorization

### 8.7.1 Permittee Responsibilities

Upon approval of the Plan by the Wildlife Agencies, the Permittees will be issued permits for take of covered species. For projects conducted by a Permittee, the Permittee will be responsible for assuring that the project conforms to the requirements of the Plan, following the process for utilizing take authorization described in Chapter 6, Section 6.7.1 *Evaluation Process for Permittee Projects*.

The Permittees will also be capable of extending Plan coverage to private landowners and other private project proponents within the permit area who are under their jurisdiction, provided that their projects or activities are covered by the Plan and are executed in accordance with the terms and conditions of the Habitat Plan, the permits, and the Implementing Agreement. Landowners and other project proponents who receive this coverage are referred to as *Third Party Participants*.

To receive take authorization under the state and federal permits, private project proponents must apply to their local jurisdiction (i.e., the appropriate city or the County, the local land use planning agency with land use authority for the project) for take authorization following the process described in Chapter 6, Section 6.7.2 *Application Process for Private Projects*.

The participating cities and the County will be the agencies with primary authority and responsibility for reviewing private development applications and authorizing take. Unless another entity is specifically identified in the Plan as responsible for a particular aspect of reviewing private development applications and authorizing take, the responsibility and authority will rest with the cities and the County. Each Permittee will hold all responsibility and authority for their own projects but will have to report their amount of take to the Implementing Entity for tracking purposes.

For project proponents within the permit area that are not subject to the land use authority of a Permittee (i.e., special districts), the project proponent must apply to the Implementing Entity as a Participating Special Entity (see Section 8.4 *Participating Special Entities*).

## 8.7.2 Implementing Entity Responsibilities

The Implementing Entity will have limited responsibility and authority in reviewing and approving take authorization. Its primary role will be to track the amount and type of take authorization, and to support the Permittee's decision-making process rather than to serve as a final authority to the Permittees. Accordingly, the Implementing Entity will provide tools for Permittees to use in their application review and project assessment process (e.g., checklists, template planning survey report, fee calculator). The Implementing Entity must track impacts of all covered activities in a way that detects when any impact cap is being approached. The Implementing Entity will notify the Permittees when any impact cap is imminent and what procedures should be followed to ensure that the cap is not exceeded. In addition, the Implementing Entity will provide advice, upon request, to the cities and the County as they process applications for take permits and will promote coordination among Permittees to ensure that the Plan is implemented consistently and effectively.

The Implementing Entity has specific authority related to reviewing and approving take authorization, as listed below.

- Reviewing applications from Participating Special Entities (Section 8.4 *Participating Special Entities*) and authorizing take as appropriate.
- Approving offers of land in lieu of fees (Section 8.6.7 *Land Dedication In Lieu of Development Fee*) and of restoration or creation of wetlands in lieu of wetland mitigation fees (see Chapter 9, Section 9.4.1 *Habitat Plan Fees* subheading *Wetland Mitigation Fee*). Local jurisdictions must forward such applications to the Implementing Entity for review, approval, and calculation on a case-by-case basis of the required fees, if any. Once the proposal is approved, the terms of the land offer, habitat restoration/creation, and any remaining fees will be forwarded to the local jurisdiction for their incorporation into the project conditions of approval.
- Reviewing and approving stream-setback exceptions requested by a local jurisdiction, and reviewing and commenting on, if necessary, stream-setback exceptions requested by a private applicant (see Chapter 6, Section 6.5, subheading *Condition 11 Stream and Riparian Setbacks*).
- Recalculating the fees annually according to the indices described in Chapter 9, Section 9.4.1 *Habitat Plan Fees* subheading *Adjustment of Mitigation Fees* or periodically according to the assessment process described in the same section, and providing the new fees to the Permittees. The Implementing Entity will notify each Permittee of the new fees.
- Approving the design requirements for rural road projects as they relate to the covered species and are consistent with the conditions described in Chapter 6, Section 6.4.4, subheading *Condition 6 Design and Construction Requirements for Covered Transportation Projects*.

### 8.7.3 Wildlife Agency Responsibilities

The Wildlife Agencies will not be involved in approving take authorization for Permittees or for private development projects within the jurisdiction of the Permittees on a project-by-project basis, except in limited circumstances (e.g., where Section 7 consultations are still required [see the Section 7 process in Chapter 1 and Section 7 Assurances in Chapter 10]) or as required by this Plan (see following section). The Wildlife Agencies will also have approval authority over inclusion of Participating Special Entities (Section 8.4 *Participating Special Entities*). The Wildlife Agencies may monitor the Permittees as they grant take to individual projects. The Permittees are not required to transmit copies of application materials to the Wildlife Agencies each time an application is approved. Permittees are required, however, to provide such information to the Wildlife Agencies upon request. The Wildlife Agencies may offer comments to Permittees, but the granting of take authorization to individual covered activities will remain the purview of the Permittees. The purpose of Wildlife Agency monitoring issuance of take authorization to covered activities is to facilitate communication so that errors or differences of opinion can be addressed before they become serious problems.

The Wildlife Agencies' main responsibility however, will be ensuring that the Permittees are in compliance with the state and federal permits, Implementing Agreement, and Plan. Reviewing and commenting on annual reports and monitoring reports (see Section 8.10 *Data Tracking*) will be a key means for the Wildlife Agencies to monitor compliance. The Wildlife Agencies will also review and approve all:

- Reserve unit management plans,
- Site restoration plans,
- Plant and pond creation proposals<sup>15</sup>,
- Covered species translocation activities,
- Tier 3 burrowing owl conservation actions,
- Burrowing owl management agreements,
- Burrowing owl passive relocation,
- Conservation easements, and
- Land acquisition proposals.

## Additional Review

A small subset of the covered activities will require additional review and approval by the Wildlife Agencies to ensure that the covered activity is adequately defined, consistent with the Habitat Plan, and incorporates appropriate conditions in Chapter 6. Early consultation with the Wildlife Agencies is strongly encouraged to ensure that relevant conditions of the Plan are incorporated into project designs and proper surveys are conducted in advance of project construction. These projects and the allowable scope of Wildlife Agency review are described below (see Chapter 2 for details on these activities).

- Highway, roadway, interchange upgrades, and mass transit projects occurring outside the planning limit of urban growth or in any in-stream area. The scope of the early design coordination will be limited to ensuring the relevant conditions of the Plan are incorporated into project design.
- Flood protection projects proposed by SCVWD that are covered by this Plan. The scope of this review will be limited to early conceptual design and to ensuring that impacts described in Chapter 4 are not exceeded and that the conditions in Chapter 6 are being applied properly to minimize effects on covered species.
- Levee reconstruction projects that go beyond the current footprint of the levee and results in permanent impacts to the stream.

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<sup>15</sup> If the Implementing Entity establishes a Habitat Plan RGP or other approved permitting process with the Regional Boards, the Corps and Regional Boards would also have review authority over restoration and creation projects that are intended to meet the mitigation requirements of those agencies.

- Supplemental water pipeline alignment associated with dam seismic retrofit projects that occurs in natural land cover types.
- Borrow sites for dam seismic retrofit projects will also be subject to additional Wildlife Agency review due to the uncertain location and size of these projects. The scope of the Wildlife Agency review of proposed borrow sites will be limited to location, size, and impacts of the borrow sites to covered species and their habitat.
- Alamos Creek/Almaden Reservoir fish passage. The scope of the Wildlife Agency review will be limited to the effects of the selected fish passage alternative on the covered species.
- Dewatering events at reservoirs where flows will be released to local channels. This includes review and approval of a reservoir-specific dewatering plan, which will be developed prior to the first dewatering event at each covered reservoir.
- Reoperation of the Ford Road or Church Avenue groundwater recharge ponds, if SCVWD identifies a potential change in downstream flows at either facility that may affect covered species beyond that identified in Chapter 4 (no changes in downstream flows are expected at either site).
- Activities that are major new point sources of nitrogen deposition that could adversely affect serpentine natural communities and associated covered species (e.g., new power plant, large diesel generators, or other facilities). The Wildlife Agencies will determine if the effects analyzed in the Habitat Plan adequately address the effects of new major sources of nitrogen. If the effects were not adequately analyzed, a major amendment, as described in Chapter 10, may be appropriate.

## 8.8 Three Creeks HCP

As described in Chapters 2 and 5, the SCVWD is preparing a separate HCP for its water supply operations in the three watersheds that drain to the San Francisco Bay—the Coyote Creek, Guadalupe River and Stevens Creek watersheds (proposed Three Creeks HCP). The proposed Three Creeks HCP includes implementation of the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE). Many of the covered activities and conservation actions proposed in the Three Creeks HCP in the Coyote Creek and Guadalupe River watersheds are also included in this Plan. Both plans are consistent with each other for these overlapping covered activities and conservation actions.

The permits for the two plans will not overlap. SCVWD will request a permit from NMFS for the proposed Three Creeks HCP but not the Habitat Plan. SCVWD will request incidental take authorization for impacts not addressed in this Habitat Plan from USFWS for covered species affected by Three Creeks HCP covered activities through either Section 7 or Section 10 of the ESA, as appropriate. For example, the Habitat Plan does not cover the upper Guadalupe River Watershed above Vasona Lake (e.g., Lexington Reservoir is not covered by the Habitat Plan) but this area is covered by the Three Creeks HCP.

Similarly, the Habitat Plan excludes a small portion of the lower Coyote Creek Watershed in the City of Milpitas that is covered by the Three Creeks HCP (see **Figure 1-3**).

We expect consistent and cooperative implementation of the two plans because, where there is geographic and functional overlap of the two conservation plans, (a) the two plans provide for conservation goals, objectives, and actions that are consistent with each other, and (b) any proposed Three Creeks HCP conservation measures implemented prior to approval of the Habitat Plan will be consistent with the measures provided for in the Habitat Plan. For example, the Habitat Plan identifies areas where suitable habitat exists and may be acquired, protected, and managed to contribute to the recovery of listed species. SCVWD will provide mitigation for terrestrial species and habitats consistent with what has been proposed by the Habitat Plan—e.g., within the areas identified to be acquired and using the same criteria to guide acquisition, protection, management, and monitoring by the Habitat Plan.

## 8.8.1 Implementation Structure

As the sole permittee for the proposed Three Creeks HCP, the SCVWD is solely responsible for administering and implementing that plan and for compliance with the terms and conditions of its Implementation Agreement and permits, as well as all other applicable laws. USFWS, NMFS, CDFG, the draft settlement agreement parties, and the public will also participate in some way in the Three Creeks HCP implementation. The successful execution of the Three Creeks HCP conservation strategy, monitoring and adaptive management program, and reporting that are part of the Three Creeks HCP require coordinated actions between and among the SCVWD, the Wildlife Agencies, and in some cases, other parties.

## 8.8.2 Adaptive Management

SCVWD will be responsible for, and oversee, the monitoring and adaptive management program for the proposed Three Creeks HCP, which has been designed to be consistent with the monitoring and adaptive management program of this Plan (Chapter 7). The SCVWD will perform day-to-day activities, including prioritizing management actions, disseminating information, developing annual and long-term work plans, and formulating adaptive management strategies. SCVWD may implement additional and/or modified biological monitoring, studies, or management measures consistent with the Three Creeks HCP.

The Wildlife Agencies, among others, will provide input and help guide the proposed Three Creeks HCP's adaptive management program, but the SCVWD has ultimate responsibility for implementing the program and instituting changes through adaptive management.

## 8.9 Implementing Agreement

The NCCP Act requires an Implementing Agreement for all NCCPs, and specifies necessary provisions. Although not a requirement under ESA, Implementing Agreements are recommended by USFWS for large-scale HCPs that address significant portions of a species range, for HCPs with long-term mitigation and monitoring programs, or for HCPs that include complicated conservation programs.

The purpose of an Implementing Agreement is to ensure that each party understands its obligations under the HCP Section 10(a)(1)(B) permits and NCCP permit, and to provide remedies should any party fail to fulfill its obligations. Accordingly, an Implementing Agreement has been prepared for this Plan (**Appendix B**). This agreement specifies the responsibilities of each party; how minimization, mitigation, and conservation measures will be implemented; reporting and enforcement procedures; and various other provisions agreed to by the parties. The Implementing Agreement references material in the Habitat Plan whenever possible. As a result, the Habitat Plan and the Implementing Agreement have been made as consistent as possible. In the unlikely event that there are inconsistencies among documents, the permits prevail first, then the Implementing Agreement, and finally the Habitat Plan.

## 8.10 Data Tracking

### 8.10.1 Database Development and Maintenance

The Implementing Entity will develop and maintain a comprehensive data repository (i.e., database) to track permit compliance and all other aspects of the Habitat Plan including land and stream management and monitoring. The data repository to track permit compliance will be operating within 12 months after all local ordinances take effect. The data repository will be structured to be “user friendly,” such that a trained staffer (as opposed to a technician or programmer) can enter data. Additionally, the data repository will allow for future expansion and integration with an external database (e.g., linkage to agency or other GIS map libraries). The data repository will be structured to facilitate the following requirements.

- Data documentation such that future users can determine why, how, and where data were collected (documentation standards [i.e., data about the data] should be consistent for all types of monitoring and over time; adequate documentation will facilitate the future use of monitoring data).
- Quality assurance and quality control of the data.
- Access and use of the most current information in assessment and decision making (the database will allow repeated access to current and past information over time).
- Storage of spatial information in a GIS-linked or similar database.

- Data queries and reports.

The primary types of information for which the data repository will be developed and maintained are listed below.

- Status of covered activities, including implementation and impacts on covered species and natural communities.
- Status of Habitat Plan natural community preservation/enhancement/creation/restoration conservation measures.
- Habitat Plan funding and expenditures.
- Monitoring and directed study results.
- Adopted changes to the Habitat Plan, including administrative changes, minor amendments, or major amendments (all defined in Chapter 10).
- All reports and documents generated by the Implementing Entity or the Permittees related to the Habitat Plan.

When the database is first operational after the first year of implementation, it will support as many of the components listed above as will be needed to report on Plan compliance. For example, funding and expenditures will begin in the first year but the results of directed studies will not be available for several more years.

The Implementing Entity may choose to develop a web-linked database to facilitate members of the public and Permittee staff obtaining site-specific information and controlled transfer of information by others into and out of the database. Examples of benefits that could be associated with maintaining controlled web-linked access to selected elements of the comprehensive Habitat Plan database are provided below.

- Development of database entry forms or use of handheld devices that could allow direct input of information into the database by those charged with implementing covered activities, conservation measures, monitoring surveys, and directed studies.
- Access by agencies implementing the Habitat Plan to digital monitoring, research, and other data for purposes of generating internal reports that may be needed to facilitate their participation in the Habitat Plan.
- Access by agencies implementing the Habitat Plan, other ecosystem restoration programs, outside researchers, and other interested parties to Habitat Plan reports and documents.

The Implementing Entity will comply with the data sharing requirements of the Implementing Agreement. If the Implementing Entity allows additional access to the project databases, such access will require strict controls and monitoring to ensure that the integrity of the database is maintained (e.g., use of passwords to limit access of a particular entity to selected database functions, sampling data entry forms to ensure that entered information is complete, compatible, and accurate).



## 8.10.2 Compliance Tracking

The Implementing Entity will track all aspects of compliance with the permits, Implementing Agreement, and Habitat Plan. To track compliance, the Implementing Entity will maintain data as specified below.

- The amount of land cover (**Tables 4-2 and 4-3**), modeled habitat for covered species (**Table 4-4**), and critical habitat (**Table 4-9**) temporarily and permanently impacted by covered activities will be tracked by the Implementing Entity regularly, but no less than annually by overlaying impacts that year (and cumulatively) with each species model in a GIS exercise to ensure that impact caps are not exceeded. Modeled habitat impacts (**Table 4-4**) and modeled habitat acquisition requirements (**Table 5-17**) will be tracked according to the most recently developed land cover maps and habitat models. Implementation of species surveys described in Chapter 6 and the remaining Conservation Strategy (Chapter 5) will be directed by the most current land cover maps and habitat models updated and maintained by the Implementing Entity throughout the permit term.
- The location, extent, and timing of land acquisition and Habitat Plan reserve establishment within each Conservation Analysis Zone according to the requirements in Chapter 5 and in **Tables 5-11, 5-13, 5-16, 5-17, and 5-18**.
- Tracking implementation of management agreements for western burrowing owl nesting habitat (number of acres under management).
- The status of implementation of each conservation action listed in **Tables 5-2a and 5-2b**.
- The success of the conservations actions in meeting the biological objectives in Chapter 5 and in **Tables 5-1a through 5-1d**.
- Descriptions of recorded conservation easements, management agreements for western burrowing owl nesting habitat, lands acquired in fee title, interagency memorandums of agreement, or any other agreements entered into for the purposes of protecting, enhancing, restoring, or creating covered species habitat.
- The location, extent, and timing of impacts on land cover types (including direct and indirect impacts to wetlands) and plant occurrences, by year and cumulative total<sup>16</sup>, based on reports submitted by project proponents and Permittees for take authority under the Habitat Plan.
- The location and extent of annual and cumulative compliance with the species occupancy requirements.
- The location, extent, and timing of restoration or creation of applicable land cover types (**Table 5-12**).
- The location, extent, timing, and progress of plant occurrence creation and enhancement (**Table 5-16**).

<sup>16</sup> Although the tables in Chapter 4 describe impact limits by Permittee, this was done for estimation purposes only. During Plan implementation, take and compliance tracking will be measured against total impact limits for the Permittees collectively.

- The location, extent, timing, and success rates of implementation of all other conservation actions described in Chapter 5 (e.g., preparation of reserve unit management plans, including recreation plans, construction of artificial perches, conducting monitoring).

The Wildlife Agencies may also request other information from the Implementing Entity to verify compliance with the Plan and the Wildlife Agencies' decision documents (e.g., CEQA and NEPA mitigation measures, impacts to critical habitat units). The purpose of monitoring this information will be to track the Implementing Entity's progress toward successful implementation of the conservation strategy described in Chapter 5 of this Plan. This tracking of progress will help ensure that habitats for covered species and natural communities are conserved within the Reserve System at a rate commensurate with the timing and magnitude of impacts from covered activities. The data repository for permit compliance tracking will be operating within 12 months after all local ordinances take effect.

The data will also be linked to supporting information documenting Habitat Plan compliance. These reports and other data will be stored and archived electronically whenever possible. Appropriate supporting information includes the following categories.

- Application material submitted for covered activities.
- Preconstruction survey reports.
- Reports and other documentation related to the screening, selection, and acquisition of reserve lands.
- Designs for covered activities that demonstrate compliance with relevant conditions in Chapter 6 (e.g., urban-wildland interface design elements).

HabiTrak is a standardized database developed by CDFG and others to track NCCP implementation. The database developed for the Plan must be compatible with the HabiTrak system or its successor so that compliance tracking for this Plan can be compared with other NCCPs in California.

Compliance tracking will be supported by the monitoring and adaptive management program described in Chapter 7. In addition to compliance tracking, the monitoring program includes effectiveness monitoring, status and trends monitoring, and directed studies aimed at addressing key management or ecological questions. The data tracking system will be developed to assemble, store, and analyze all monitoring data in the program. The details of the monitoring program will not be developed until individual reserve unit management plans are prepared for each reserve (**Table 8-1**). By necessity, therefore, the data tracking system for the monitoring and adaptive management program cannot be finalized until after this Plan is completed.

## 8.11 Reporting

The Implementing Entity will prepare annual reports over the term of the Habitat Plan that document permit compliance (see Section 8.10.2 *Compliance Tracking*), impacts, conservation actions, management actions, restoration/creation actions, and monitoring results. The annual reports will summarize the previous fiscal year's implementation activities (July 1 to June 30) and be completed by March 15 following the reporting fiscal year. No annual report will be required for the first partial fiscal year. Annual reports will require synthesis of data and reporting on important trends such as land acquisition, fee collection, and habitat restoration. A due date of March 15 will allow time for the data from the previous fiscal year to be assembled, analyzed, and presented in a clear and concise format.

Annual reports will be submitted to the Implementation Board for review and approval. Annual reports will also be submitted to designated representatives of the Wildlife Agencies, and other interested parties such as the Corps and Regional Boards, and will be available to the public and posted on the Habitat Plan website. The Implementing Entity will also distribute these reports to the Independent Conservation Assessment Team and science advisors, as appropriate, for their review. These advisory bodies will use results presented in the annual reports, as well as other available information and any additional monitoring reports produced through the Adaptive Management Program, to assess success of the Habitat Plan in meeting the biological goals and objectives and to formulate recommendations to the Implementing Entity for Plan implementation in subsequent years.

The goals of the annual report are listed below.

- Providing the information and data necessary for the Permittees to demonstrate to the Wildlife Agencies and the public that the Plan is being implemented properly and as anticipated.
- Disclosing any problems with Plan implementation so they can be corrected.
- Documenting issues with Plan implementation that may require consultation with the Wildlife Agencies.
- Identifying administrative or minor changes to Plan components required to increase the success of conservation measures.

At a minimum, annual reports will include the following information.

- A description of all covered activities implemented during the reporting period categorized by major activity type (per Chapter 2) and acreage.
- A year-to-date and cumulative summary (i.e., from the start of the permit term) of permanent and temporary impacts on all land cover types. Impacts on riparian and wetland land cover types will also be reported by watersheds.

- A year-to-date and cumulative summary of impacts to modeled habitat of covered species<sup>17</sup> and to covered plant occurrences.
- A year-to-date and cumulative summary of the total impacts to critical habitat of the California red-legged frog, California tiger salamander, and Bay checkerspot butterfly.
- A year-to-date and cumulative summary of impacts associated with projects exempt from fees and/or conditions of this Plan.
- An accounting of all conditions on covered activities applied to these activities (see Chapter 6).
- A list of all riparian setback exceptions granted each calendar year (Chapter 6).
- A description of all natural community protection/enhancement/creation/restoration conservation actions implemented during the reporting period. Riparian and wetland restoration and creation will also be reported by the watersheds shown in **Figure 3-6** to facilitate regional coordination of wetland mitigation for the Corps and the Regional Boards.
- A year-to-date and cumulative summary of stream and riparian restoration conducted outside of the Reserve System.
- A year-to-date and cumulative summary of the extent of land cover types protected, enhanced, restored, or created. The success rate for restoration and creation projects will also be documented. If conservation easements were used, the report will describe who holds the easements. A map containing this information will also be provided.
- A year-to-date and cumulative summary of the extent of modeled habitat for covered species protected. This will be calculated by overlaying the most current species habitat models.
- A copy of all easements recorded during the reporting year.
- A year-to-date and cumulative summary of the protection of occupied habitat for select covered wildlife species described in Chapter 5.
- A year-to-date and cumulative summary of the protection or creation of covered plant occurrences and occupied habitat for selected covered wildlife species as defined in Chapter 5.
- A year-to-date and cumulative summary of permanent and temporary management agreements for the burrowing owl to demonstrate that the amount of managed lands for the burrowing owl at no time decreases during the permit term, as described in Chapter 5.
- A year-to-date and cumulative summary of exceptions to the burrowing owl passive relocation prohibition, as described in Chapter 6.
- An assessment of the progress toward all acquisition requirements by local, state, and federal sources, including land cover types, landscape linkages,

<sup>17</sup> Species habitat models will be updated during the permit term based on best available science. This data will be used for tracking compliance for impacts and conservation.

covered plant occurrences, and wetland protection. This assessment will include evaluation of compliance with the reserve design and assembly principles in Chapter 5 (e.g., minimizing edge).

- An assessment of compliance with the Stay-Ahead provision (Section 8.6.1 *Stay-Ahead Provision*) and a forecast of expected take and land acquisition needs for the next 2 years.
- An accounting of all revenues received, by type (e.g., development fees, wetland fees, grants) and an assessment of progress towards total revenue goals. Funding from local, state, and federal sources must be tracked separately. Any fee adjustments must also be reported.
- An evaluation of the economic assumptions on which the Plan was based (e.g., Plan costs, revenue rates and grant funding projections).
- An assessment of progress toward a complete funding strategy for implementation after the permit term (Chapter 9, Section 9.4.2, subheading *Interest Income*).
- A summary of all land and water management activities undertaken on and off the reserves and a discussion of the management issues facing the Implementing Entity.
- A presentation of the conceptual ecological models developed to date and any changes to them that have taken place.
- A description of the landscape-, natural community-, and species-level monitoring undertaken during the reporting period and a summary of monitoring results, including species status and trends.
- A description of the adaptive management process utilized during the reporting period (e.g., consultation with science advisors, convening of the Independent Conservation Assessment Team).
- A summary of the recommendations or advice provided by the Wildlife Agencies, science advisors, and the Independent Conservation Assessment Team (if applicable) regarding adaptive management and monitoring.
- A summary of the monitoring program objectives, techniques, and protocols including monitoring locations, variables measured, sampling frequency, timing, and duration, analysis methods, and who performed the analyses.
- An assessment of the efficacy of the monitoring and research program and recommended changes to the program based on interpretation of monitoring results and research findings.
- An assessment of the efficacy of habitat restoration and creation methods in achieving performance objectives and recommended changes to improve the efficacy of the methods.
- A description of all Habitat Plan directed studies undertaken during the reporting period; a summary of study results; and a description of integration with monitoring, assessment, and compliance elements.
- An assessment of the appropriateness of performance indicators and objectives (see **Table 7-1** for examples) based on the results of effectiveness

monitoring, and recommended changes to performance indicators and objectives.

- An assessment of changes in temperature in the study area (see Chapter 10, Section 10.2.1 *Changed and Unforeseen Circumstances*).
- A description of any actions taken or expected regarding changed circumstances, including remedial actions.
- A description of any unforeseen circumstances that arose and responses taken.
- A year-to-date and cumulative summary of Certificates of Inclusion issued for Neighboring landowner agreements, including the size and location of lands covered by them.
- A summary of any administrative changes, minor modifications (e.g., updates to **Figure 2-5**), or major amendments proposed or approved during the reporting year (see Chapter 10, Section 10.3 *Modifications to the Plan*).

Federal guidelines for the contents of monitoring reports also recommend inclusion of biological goals and objectives in these reports. However, **Tables 5-1a-d and 5-2a-b** serve this purpose. Therefore, biological goals and objectives do not need to be reported annually (progress towards meeting the goals and objectives will be reported, however).

Electronic copies of the following data will be provided upon request to the Wildlife Agencies and to the public<sup>18</sup>.

- Copies of all non-confidential, non-proprietary portions of the database that track covered activities and land acquisition in the possession and control of the Implementing Entity in its current state.
- Copies of all relevant GIS data in possession and control of the Implementing Entity in its current state, including land cover, the location of covered activities, and the boundaries of the current Habitat Plan Reserve System.
- Copies of all non-confidential, non-proprietary financial data in possession and control of the Implementing Entity in its current state.

## 8.12 Schedule and Deadlines

To ensure a successful Plan, the Implementing Entity will make progress on a variety of tasks simultaneously. Tasks during the first several years of implementation will be particularly important to ensure positive momentum and early compliance with Plan terms and conditions. Schedule guidelines and major deadlines for Plan implementation are presented in **Table 8-1**. Tasks are divided

<sup>18</sup> Data provided to the public will be subject to any restrictions on proprietary or confidential data or services that may be utilized by the Implementing Entity such as proprietary aerial photos, parcel databases, confidential species locations, or pending land transactions.

among the Permittees, Cities and County, and the Implementing Entity. The Implementing Agreement will establish deadlines for certain tasks.

**Table 8-2** lists those key implementation tasks with deadlines that are tied to permit compliance. As described in the table, these deadlines have various levels of flexibility depending on the circumstances. Implementation deadlines are important to establish a mutual understanding among the Permittees and the Wildlife Agencies about how the Plan will be implemented over time and to ensure that the Plan will be implemented in a timely manner. However, the Permittees and the Wildlife Agencies recognize that under certain circumstances, modifications to the deadlines beyond the flexibility provided in **Table 8-2** could be reasonable and appropriate. The Implementing Entity may modify, with the approval of the Wildlife Agencies, the deadlines through minor modifications or major amendments to the Plan, as described in Chapter 10, Section 10.3 *Modifications to the Plan*.

Before permits are issued, the Local Partners will set the groundwork for Plan implementation by establishing the implementation organization. Grant writing, land acquisition, and training of local jurisdiction staff may also commence before permit issuance. During the first 6 months of the permit term, emphasis will be placed on hiring key administrative staff for the Implementing Entity (or contracting out their functions), establishing the Public Advisory Committee, establishing local ordinances required to fund and implement the Plan, and developing implementation tools. At initiation of the permit term, tasks of grant writing, land acquisition, and Plan implementation training will transfer from the Permittees to the Implementing Entity or its agent (e.g., a local land management agency). During the permit term, the Implementing Entity will be responsible for these tasks. Both the local jurisdictions and the Implementing Entity will be responsible for collecting development fees throughout the permit term. Within the first year, the Implementation Entity will secure necessary staff and contract resources, identify scientific advisors, create a Plan implementation web site, establish the required database, and investigate wetland restoration opportunities.

Over the next 5 years, additional Reserve staff will be hired or contracted, and more specific reserve unit management plans will be created and initiated to manage and monitor the expanding Reserve System. Environmental compliance and design for wetland restoration and creation will be initiated. The Implementing Entity will also begin to develop strategies for post-permit funding for monitoring and management. Beginning with this period and extending throughout the remaining permit term, fees will be updated and adjusted on a regular basis, and conservation assessments will be conducted. In addition, the hiring and contracting of staff will be completed to manage the Reserve System and implement the Plan. Habitat restoration and design will continue, as will the adaptive management and monitoring of biological resources.

Between Years 6 and 50, the Implementing Entity will continue to implement the conservation strategy, implement monitoring and adaptive management, and refine these programs as monitoring and other data are collected. Land acquisition that will require restoration or creation must be completed by Year 40. All other land acquisition must be completed by Year 45, and

construction of all restoration and creation projects must be completed by Year 40 of the permit term. (See Chapter 9 for a discussion of funding adequacy to meet these deadlines.)

Before the end of the permit term, the Implementing Entity will also determine the administrative structure necessary to continue management on the Reserve System in perpetuity. For example, management responsibility may be delegated to one of the Permittees to continue to oversee in perpetuity. Alternatively, the Joint Powers Authority may extend its term to continue to oversee implementation of the Habitat Plan.



**Table 8-1.** Schedule for Major Implementation Tasks

<b>Time Period</b>	<b>Tasks and Milestones</b> (**Key Task Tied to Permit Compliance; see <b>Table 8-2</b> ) [If applicable, Habitat Plan reference included]	<b>Responsible Party<sup>1</sup></b>
<b>Prior to Permit Issuance (i.e., Year 0)</b>		
	Complete final versions of Implementing Agreement, Joint Exercise of Powers Agreement, and Permittee ordinances in preparation for permit issuance and Implementing Entity formation. [Chapter 8, Section 8.5]	Local Partners
	**Establish Implementing Entity through execution of the Joint Exercise of Powers Agreement. File with State Secretary of State within 30 days of its effective date. [Chapter 8, Section 8.2.2]	Local Partners
	**In accordance with the Implementing Agreement and Joint Exercise of Powers Agreement, establish Habitat Plan implementation organizational structure (i.e., Implementing Entity's Governing Board and Implementation Board). [Chapter 8, Section 8.2]	Local Partners
	Where feasible, apply for state/federal grants for land acquisition (after publication of Draft Habitat Plan). [Chapter 8, Section 8.3.5; Chapter 9, Section 9.4.3]	Local Partners
	Develop template Habitat Plan application package for use by private applicants and Permittees that includes all items required in Chapter 6, Section 6.8 (Items 1 through 6).	Local Partners
	Develop a checklist prior to the first ordinance taking effect for local planners to evaluate the Habitat Plan application package. This will help ensure compliance by each project receiving coverage under the Plan. The checklist must include a statement of certification that project applicants meet the relevant terms of the Habitat Plan. [Chapter 6, Section 6.7.2]	Local Partners
	Prepare a template form prior to the first ordinance taking effect for local planners to document that a private applicant's project is consistent with the Plan. This consistency determination will be made based on the checklist described above. [Chapter 6, Section 6.7.2]	Local Partners
	Provide each Permittee with Plan maps (e.g., fee zone, land cover, private development coverage, modeled habitat) to allow local agency staff to process and evaluate applications for Habitat Plan coverage or evaluate their own projects under the Plan. [Chapter 2, Chapter 6, Chapter 9]	Local Partners
	Train local jurisdiction staff to review and process Habitat Plan applications. This task will be ongoing.	Local Partners
	Commence the recruitment process for Implementing Entity Administrative Director and key staff (if possible, to allow early implementation). [Chapter 8, Section 8.3.2]	Local Partners
<b>By Permit Issuance (Day 1)</b>		
	Prepare initial budget for Implementing Entity.	Permittees
<b>Post-Permit</b>		
0–6 months	Hire Implementing Entity Administrative Director and key staff (if not completed prior to permit issuance). This task will be ongoing. [Chapter 8, Section 8.2.2]	Implementing Entity

Time Period	Tasks and Milestones (*Key Task Tied to Permit Compliance; see <b>Table 8-2</b> ) [If applicable, Habitat Plan reference included]	Responsible Party <sup>1</sup>
	Develop a set of biologist qualifications and establish pre-approved list of biologists per Chapter 6, Section 6.8.5. This task will be ongoing.	Implementing Entity
	Develop template pre-acquisition assessment and protocols prior to the first land acquisition. [Chapter 5, Section 5.2.3, subheading <i>Field Verification Prior to Acquisition</i> , and Chapter 8, Section 8.6]	Implementing Entity
	Train local jurisdiction staff to prepare, review, and process Habitat Plan applications. This task will be ongoing.	Permittees, with ongoing assistance from Implementing Entity
	Update GIS land cover layer with aerial photographs, satellite imagery, and other relevant data sources including serpentine soils maps at the outset of implementation. [Chapter 7, Section 7.2.2 <i>Program Phases</i> , subheading <i>Inventory Phase</i> , subheading <i>Document Baseline Conditions</i> ]	Implementing Entity
	Provide each participating local jurisdiction with detailed maps of fee zones and land cover so they can process and evaluate Habitat Plan applications. [Chapter 9, Section 9.4.1]	Implementing Entity
	Review private development applications for coverage under the Habitat Plan. This task will be ongoing. [Chapter 6, Section 6.7; Chapter 8, Section 8.7]	Cities and County
	Prepare and review applications for public sector activities under the Habitat Plan to be submitted to Implementing Entity. This task will be ongoing. [Chapter 6, Section 6.7; Chapter 8, Section 8.7]	Permittees
	Establish Technical Advisory and Public Advisory committees. [Chapter 8, Sections 8.2.4 and 8.2.7]	Implementing Entity
	Where feasible, apply for state/federal grants for land acquisition. This task will be ongoing. [Chapter 8, Section 8.3.5; Chapter 9, Section 9.4.3]	Implementing Entity, Permittees
	Determine the date by which the annual automatic update of development fees will occur. [Chapter 9, Section 9.4.1 <i>Habitat Plan Development Fees</i> , subheading <i>Automatic Adjustment of Mitigation Fees</i> ]	Implementing Entity
	Collect Habitat Plan fees. This task will be ongoing. [Chapter 9, Section 9.4.1]	Cities and County, Implementing Entity
6 months– 1 year	Hire key administrative staff of Implementing Entity or secure agreements or contracts with other organizations to fulfill these roles. [Chapter 8, Section 8.2.2]	Implementing Entity, Permittees
	Establish Habitat Plan Implementation web site. [Chapter 8, Section 8.3.9]	Implementing Entity
	Investigate aquatic enhancement, restoration, and creation opportunities on existing open space and newly acquired land to ensure Stay-Ahead on wetland impacts. This task will be ongoing. [Chapter 8, Section 8.6.1]	Implementing Entity Permittees
	Establish and maintain database to track permit compliance (e.g., land acquisition and Habitat Plan impacts). This task will be ongoing. [Chapter 8, Section 8.10.1]	Implementing Entity, Permittees

Time Period	Tasks and Milestones (**Key Task Tied to Permit Compliance; see <b>Table 8-2</b> ) [If applicable, Habitat Plan reference included]	Responsible Party <sup>1</sup>
1–5 years	Continue to hire or contract out Implementing Entity technical and operational staff as Reserve System expands. [Chapter 8, Section 8.2.2]	Implementing Entity
	**Update fees annually according to Chapter 9. Provide new fee schedule to Permittees. This task will be ongoing. [Chapter 9, Section 9.4.1]	Implementing Entity, Cities and County
	At intervals specified in Chapter 9, perform financial assessment. This task will be ongoing. [Chapter 9, Section 9.4.1, subheading <i>Adjustment of Mitigation Fees</i> ]	Implementing Entity
	**Submit annual report to the Wildlife Agencies. This task is performed on an annual basis by March 15 of every year for the previous fiscal year (July 1 to June 30). [Chapter 8, Section 8.11]	Implementing Entity
	Conduct annual meeting to report on implementation progress of Habitat Plan. This task will be ongoing. [Chapter 8, Section 8.2.7]	Implementing Entity
	Prepare reserve unit management plans as described in Chapter 5 for the five expected reserve units. <ul style="list-style-type: none"> <li>• Upper Penitencia Creek,</li> <li>• Coyote Ridge,</li> <li>• Pacheco Watershed,</li> <li>• Southern Santa Cruz Mountains, and</li> <li>• Santa Teresa Hills.</li> </ul> ** Plans must be prepared within 5 years of the first parcel acquired in each reserve unit and updated as needed, but reviewed no less than every 5 years [Chapter 5, Section 5.2.5]	Implementing Entity
	Initiate adaptive management and monitoring of biological resources. This task will be ongoing. [Chapter 7]	Implementing Entity
	Establish pool of science advisors to provide technical advice to Implementing Entity and Permittees on monitoring and adaptive management. This task will be ongoing. [Chapter 7, Section 7.2.3; Chapter 8, Section 8.2.6]	Implementing Entity
	Initiate or continue management and monitoring in Reserve System. [Chapter 5, Section 5.2.5 and Chapter 7, Section 7.1.4]	Implementing Entity t
	**Continue to acquire land to assemble Reserve System and meet Stay-Ahead provision requirements (by Year 2). This task will be ongoing; however, all land acquisition must be completed by Year 45. [Chapter 5, Section 5.3.1; Chapter 8, Section 8.6.1]	Implementing Entity Permittees
	Begin wetland restoration and creation design and additional environmental compliance for restoration and creation. This task will be ongoing. [Chapter 5, Sections 5.3.6 and 5.3.7]	Implementing Entity

Time Period	Tasks and Milestones (**Key Task Tied to Permit Compliance; see <b>Table 8-2</b> ) [If applicable, Habitat Plan reference included]	Responsible Party <sup>1</sup>
	Implement plant and aquatic land cover restoration and creation projects described in Chapter 5. This task will be ongoing; however, construction of all habitat restoration and creation projects for land-cover types and plant occurrences (Coyote ceanothus, smooth lessingia, and Metcalf Canyon jewelflower) must be completed by Year 40. [Chapter 5, Sections 5.3.1, 5.3.7, 5.4.11, 5.4.16, and 5.4.17; Chapter 8, Sections 8.12 and 8.6.1]	Implementing Entity
	Open selected reserves to public access according to reserve unit management plans. Develop enforcement procedures for the Reserve System before newly acquired land (excluding existing open space added to the Reserve System) is open to public access. [Chapter 6, Section 6.4.6. subheading <i>Condition 9</i> ; Chapter 8, Section 8.3]	Implementing Entity or applicable local agencies
	Begin implementation of required studies and prioritize implementation of remaining studies described in Chapter 5. [Chapter 7, Sections 7.2.1 and 7.2.2]	Implementing Entity
	Update land cover map with most recent aerial photograph and provide to local jurisdictions implementing the Plan (at least every 5 years). This task will be ongoing. [Chapter 7, Section 7.3.1]	Implementing Entity
	Develop a wildfire local operating agreement for the Reserve System with Cal Fire and with any other firefighting agency that has responsibility for the Reserve system lands within 4 years of permit issuance. [Chapter 5, Section 5.3.2, subheading <i>Fire Management</i> ]	Implementing Entity
	By the beginning of Year 4, renew the MBTA Special Purpose Permit for least Bell's vireo for another 3-year term. [Chapter 6, Section 6.3]	Implementing Entity
	By Year 5, develop stream management guidelines for private landowners, including an educational program to assist in the implementation of the guidelines (other public education and outreach tasks are also required, but do not have specific deadlines; see text). [Chapter 5, Section 5.3.2, subheading <i>Public Education and Outreach</i> ; Section 5.3.5, subheading <i>Private Landowner Education</i> ]	Implementing Entity
	At Year 5 and every 5 years afterwards, establish Independent Conservation Assessment Team and conduct assessment of entire conservation program. [Chapter 7, Section 7.2.3; Chapter 8, Section 8.2.6]	Implementing Entity
6–50 years	**Determine the target population size of Mount Hamilton thistle, fragrant fritillary, and Loma Prieta hoita by Year 10. [Chapter 5, Sections 5.4.12, 5.4.14, and 5.4.15]	Implementing Entity
	Initiate feasibility study when adequate monitoring data exist on wildlife movement in three focal areas described in Chapter 5, Section 5.3.2 or by year 10 of implementation, whichever comes first. [Chapter 5, Section 5.3.2]	Implementing Entity
	In year 20 of implementation, work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System. [Chapter 7, Section 7.2.3 <i>Program Implementation</i> , subheading <i>Program Infrastructure</i> ]	Implementing Entity

Time Period	Tasks and Milestones (**Key Task Tied to Permit Compliance; see <b>Table 8-2</b> ) [If applicable, Habitat Plan reference included]	Responsible Party <sup>1</sup>
	Finalize post-permit implementation structure prior to permit expiration. [Chapter 8, Section 8.12]	Implementing Entity
More than 50 years	Continue adaptive management and limited monitoring of biological resources to ensure management actions are working. [Chapter 7]	Implementing Entity

<sup>1</sup> The responsible party is the entity that must ensure the task or milestone is achieved. In many cases, the responsible party may delegate implementation of the task to a third party (e.g., a Permittee, landowner, or consultant).

**Table 8-2.** Key Deadlines for Plan Compliance

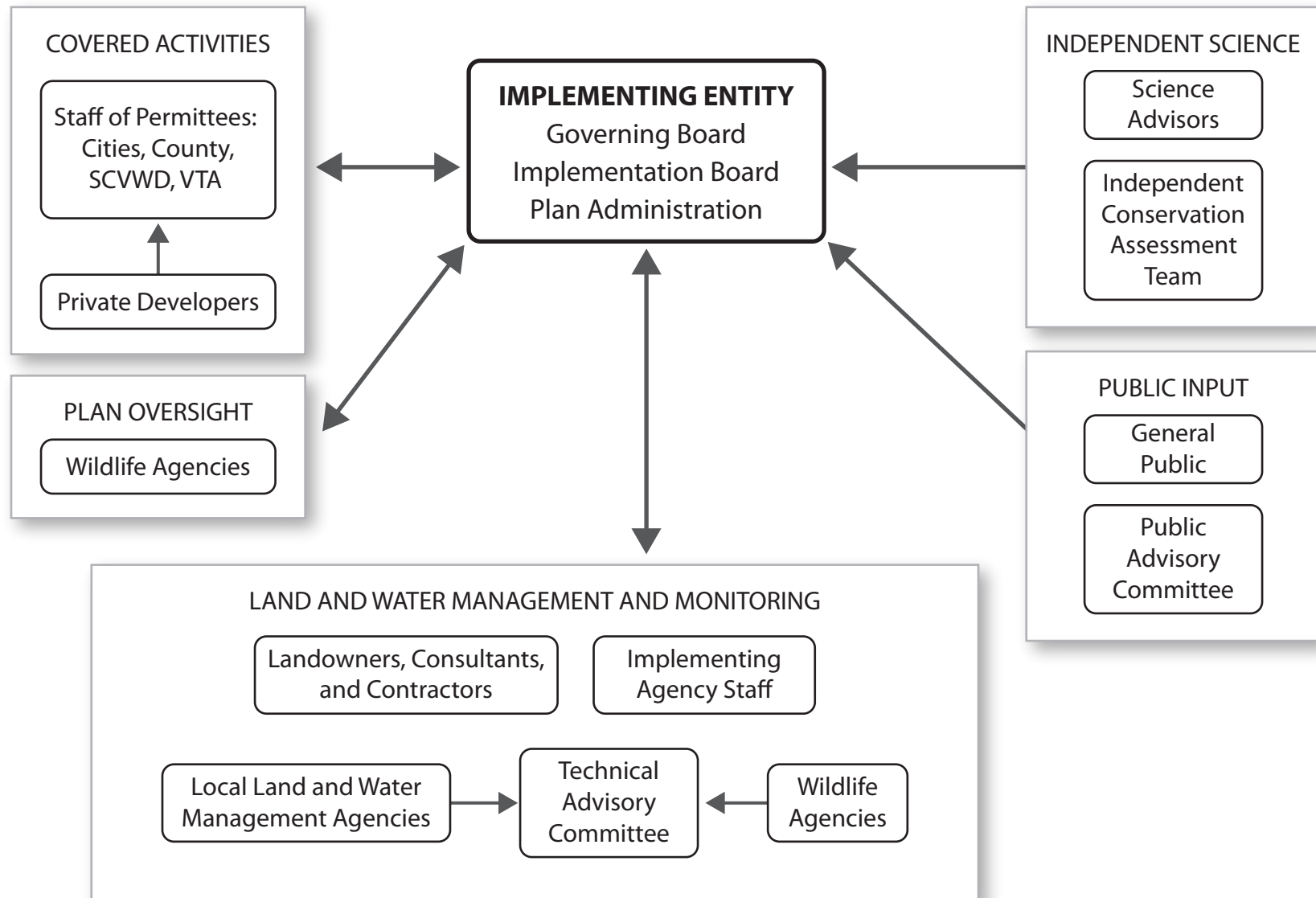
Key Implementing Entity Task With Deadline Tied to Permit Compliance <sup>1</sup>	Deadline(s)	Habitat Plan Reference	Deadline Flexibility
<b>Key Initial Deadlines</b>			
In accordance with the Implementing Agreement and Joint Exercise of Powers Agreement proposals, establish Habitat Plan implementation organizational structure (i.e., Implementing Entity's Governing Board and Implementation Board)	Prior to issuance of permits by Wildlife Agencies so that Implementing Entity can be issued the permits	Chapter 8, Section 8.2	The Permits will not cover the Implementing Entity's activities until the Implementing Entity has been formed and has submitted an application
Cities and County will consider the adoption of local ordinances to implement Habitat Plan	Within 120 days after the execution of the Implementing Agreement and the last permit is issued by the Wildlife Agencies	Chapter 8, Section 8.5	None
<b>Key Annual Deadlines</b>			
Update fees annually according to Chapter 9	Date to be determined by the Implementing Governing Board within the first 6 months of Plan implementation	Chapter 9, Section 9.4.1, subheading <i>Automatic Adjustment of Mitigation Fees</i>	Fee update can be delayed if the federal indices in <b>Table 9-9</b> are delayed
Submit annual report to Wildlife Agencies with all required information	By March 15 of each year for the previous fiscal year (July 1 to June 30)	Chapter 8, Section 8.11	Extensions available with prior approval by Wildlife Agencies
<b>Key Periodic or One-Time Deadlines</b>			
Prepare reserve unit management plans	Within 5 years of first acquisition in each reserve unit	Chapter 5, Section 5.2.5	Extensions available with prior approval by Wildlife Agencies
Acquire and enhance land; restore riparian woodland/scrub, wetlands, and streams; and create ponds in compliance with the Stay-Ahead Provision	Applies 2 years after the last ordinance takes effects and is measured annually thereafter	Chapter 8, Section 8.6.1	10% deviation below Stay-Ahead requirements is allowed
Determine the target population size of Mount Hamilton thistle, fragrant fritillary, and Loma Prieta hoita	Year 10	Chapter 5, Sections 5.4.12, 5.4.14, 5.4.15	Extensions available with prior approval by Wildlife Agencies
The Implementing Entity will work with the Wildlife Agencies to conduct a formal and complete review of progress toward building the Reserve System	Year 20	Chapter 8, Section 8.6.1	None

Table 8-2. Continued

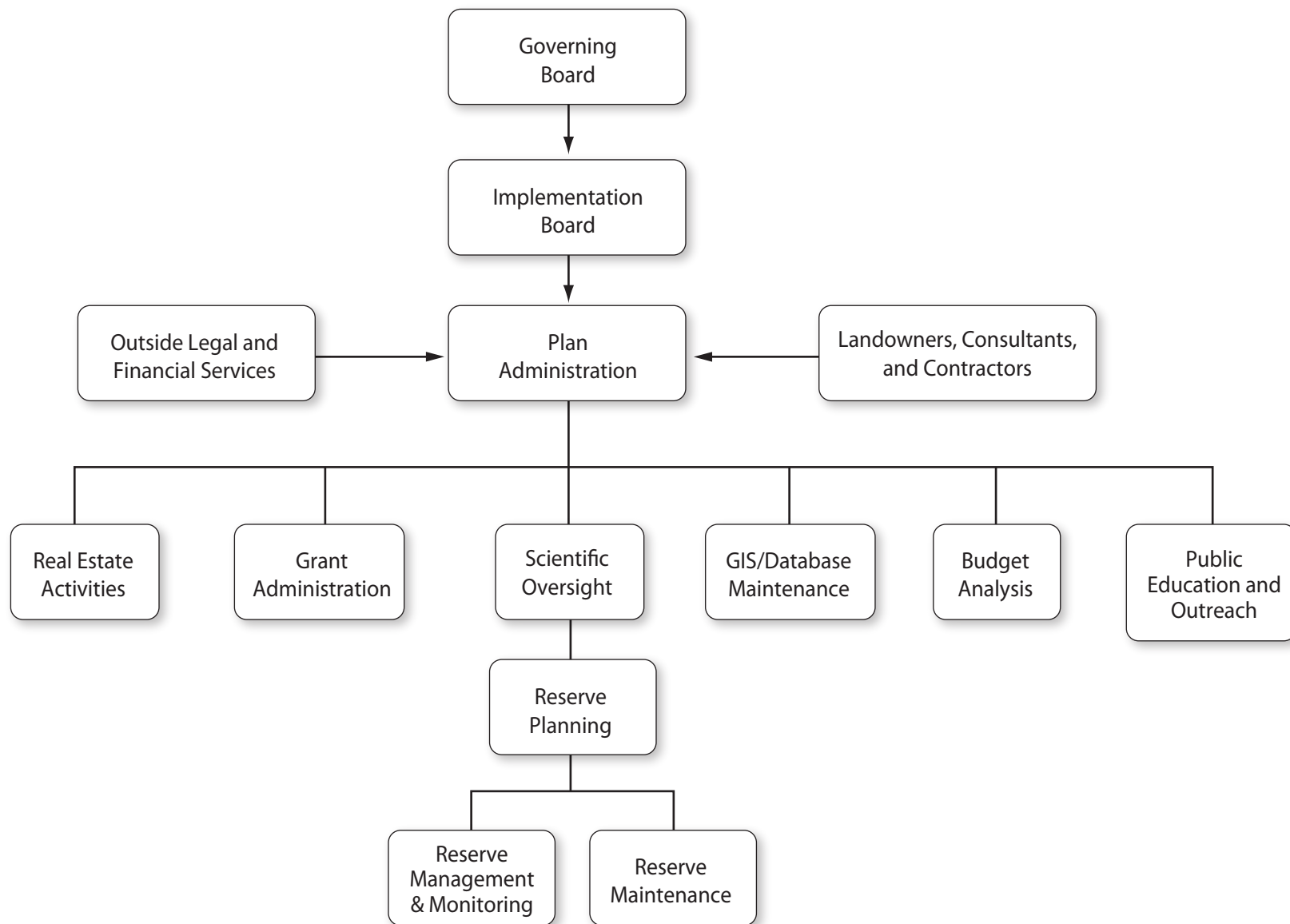
Key Implementing Entity Task With Deadline Tied to Permit Compliance <sup>1</sup>	Deadline(s)	Habitat Plan Reference	Deadline Flexibility
Restore riparian and fresh water marsh and create ponds to contribute to species recovery	Years 15, 30, 40	Chapter 5, <b>Table 5-14</b>	Extend deadline by up to one year with approval of Wildlife Agencies if Implementing Entity demonstrates progress towards milestone
Complete construction of all restoration and creation projects for land cover types and plant occurrences (Coyote ceanothus, smooth lessingia, and Metcalf Canyon jewelflower)	Year 40	Chapter 5, Section 5.3.1 subheading <i>Acquisition and Restoration Requirements for Aquatic Land Cover Types</i> , and Chapter 5, Sections 5.4. 11, 5.4.16, and 5.4.17	Success criteria for created plant populations, created ponds, and restored riparian/wetlands will be proposed in reserve management plans and restoration/creation designs. Success criteria in some cases may not need to be demonstrated by year 40, but would have to be demonstrated by the end of the permit term. The Wildlife Agencies would review these proposals as they are submitted during Plan implementation
Acquire all land for the Reserve System according to the acreage requirements in Chapter 5 by land cover type, conservation analysis zone, and landscape linkage	Year 45	Chapter 5, Section 5.3.1; <b>Tables 5-11, 5- 17, 5-18; Figure 5-9</b>	Extend by up to two years with Wildlife Agency approval if Reserve System is within up to 5% of completion
Acquire modeled habitat for covered species in the Reserve System according to the requirements in Chapter 5	Year 45	Chapter 5, <b>Table 5-19</b>	Extend by up to two years with Wildlife Agency approval if Reserve System is within up to 5% of completion
Develop a Wildlife Agency-approved plan to address the continuing obligations of the Implementing Entity beyond the permit term	Year 45-47	Section 9.4.4 subheading <i>Funding for Post-Permit Management and Monitoring</i>	None
<sup>1</sup> Responsibility for all tasks lies with the Implementing Entity unless otherwise stated.			



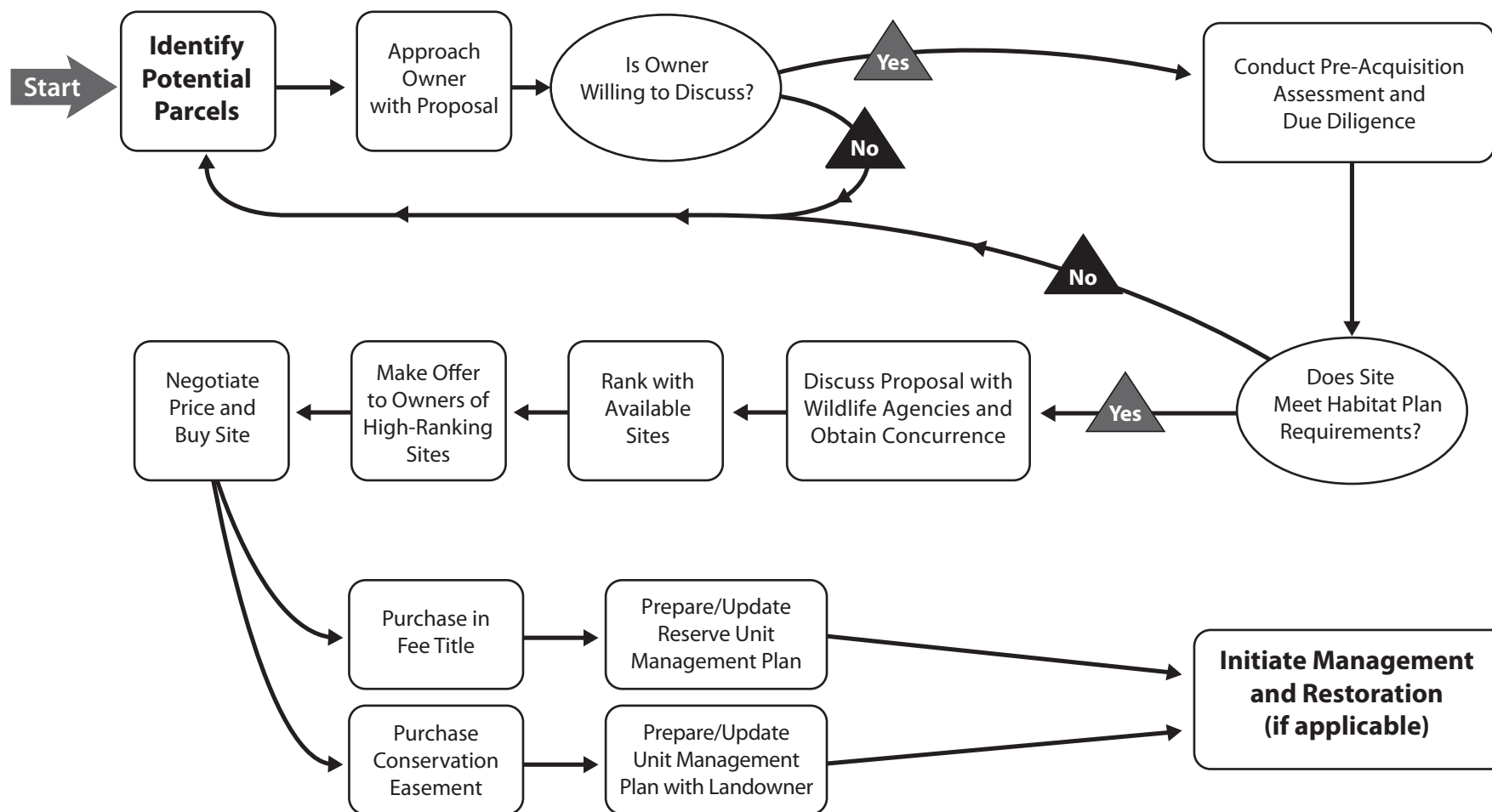


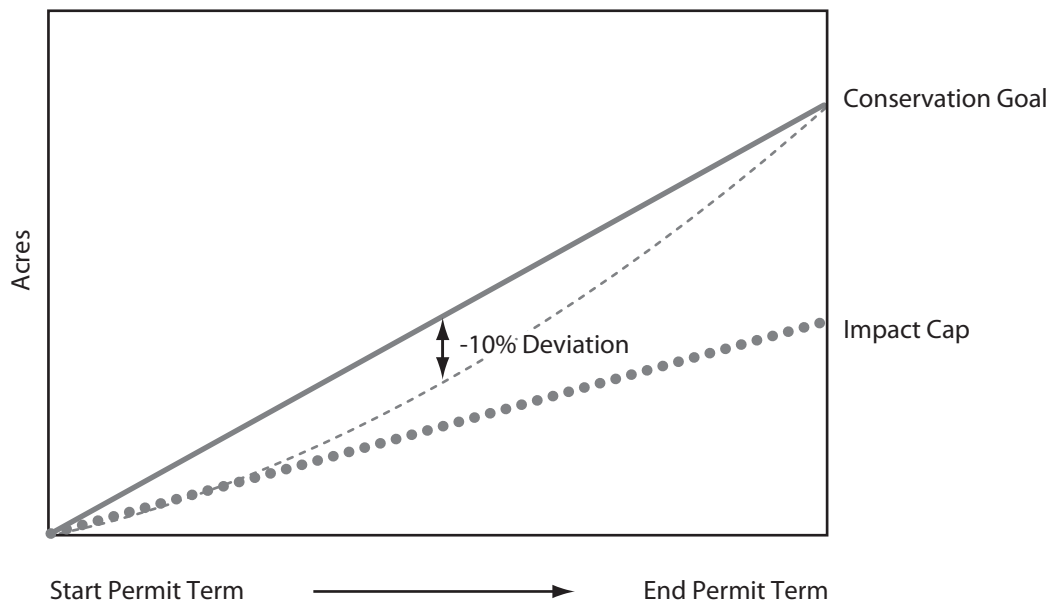


**Figure 8-1**  
**Relationship of the Implementing Entity to External Parties**

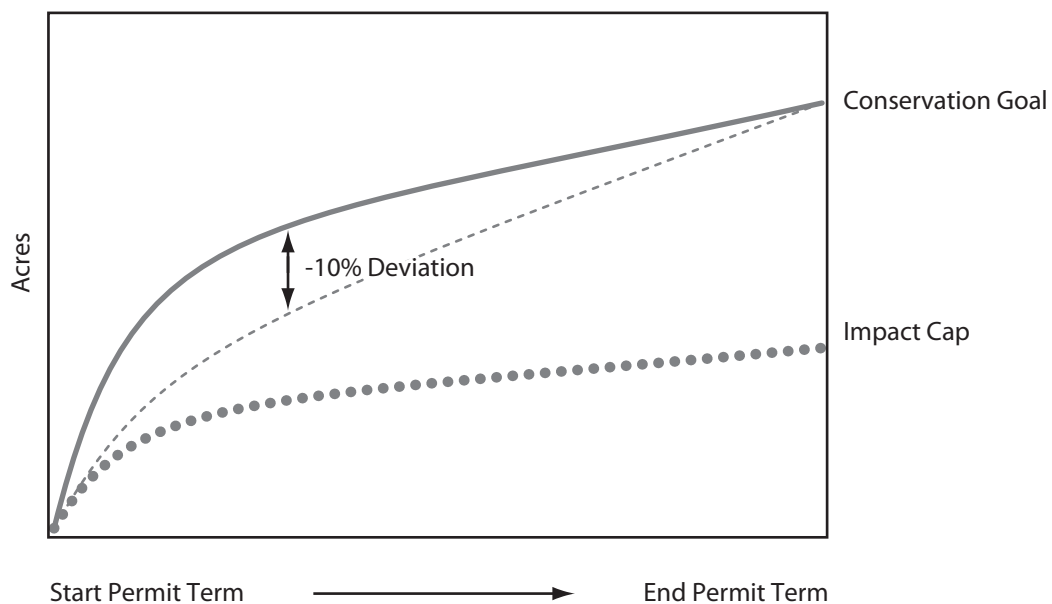


**Figure 8-2**  
**The Functions and Roles of the Implementing Entity**





a. Theoretical rate of impacts and conservation if impacts occur at an even rate (linear) throughout the permit term.



b. Theoretical rate of impacts and conservation if most impacts occur early in permit term.

## **9.1 Introduction**

This chapter describes the method used to estimate the financial resources (costs) and funding needed to implement the Habitat Plan over the 50-year planning horizon. Fees and other funding sources that support implementation of the Plan are identified, as is the funding needed to support ongoing management of the Reserve System after the permit term ends and funding adequacy.

As described in Chapter 1, as of the completion of this Plan the Local Partners were working with the Corps to develop a Regional General Permit for this Plan. Any additional costs associated with implementing the Regional General Permit are not accounted for in this chapter.

## **9.2 Cost to Implement the Habitat Plan**

Estimating the full costs of the Habitat Plan was an essential step to demonstrate adequate funding necessary to meet regulatory standards. In order to provide enough funding, all costs associated with the conservation actions had to be identified. Because of the geographic scale of the Plan, the complexity of the conservation actions, and long time scale over which these actions will occur, the cost estimating process involved many assumptions. These costs are identified for planning purposes only to estimate funding levels needed to implement the Plan. The Implementing Entity will be responsible for annually preparing and approving a budget for Plan Implementation, based on current information and projections regarding Habitat Plan assets, revenues and expenses.

Major cost categories are listed below and summarized in this chapter.

- Land acquisition.
- Reserve management and maintenance, including adaptive management.
- Habitat and covered plant occurrence restoration/creation.
- Monitoring, research, and scientific review.
- Program administration.

- Contingency.
- Costs in perpetuity.

The anticipated cost of each category is shown in **Table 9-1** which summarizes total costs, capital costs, and operational costs for the Habitat Plan. All costs are in 2010 dollars<sup>1</sup>. Costs are also estimated after the permit term as an average annual cost. Cost components expected after the permit term in perpetuity are described in Section 9.3.7 *Costs in Perpetuity*.

## 9.3 Cost Estimate Methodology

To estimate Plan costs, a cost model was developed that identified specific costs in the major cost categories (listed above) needed to fulfill terms and conditions of the Plan (**Appendix G** provides the assumptions and output of the model). The cost model was designed to demonstrate that Plan-related costs were accounted for and reasonably estimated. The model structure was refined and expanded from cost models developed for three large, complex regional HCPs and NCCPs<sup>2</sup>. The goal of the cost model was to conservatively estimate expenses of the Implementing Entity over the permit term so that overall costs are understood. This allows the Local Partners to estimate costs over the lifetime of the Plan and post-permit costs so that funding needs can be determined and a fee structure developed.

During Plan implementation, the cost model can be updated to assist the planning process as the assumptions are refined. Model assumptions are listed and described below by cost category and built into the model to facilitate updates. It is assumed that all cost components will increase due to inflation over time; as such, these were tied to cost-of-living statistics<sup>3</sup>. Cost assumptions for operations, maintenance, and administration were developed using local comparable cost data from land management agencies in the study area (County Parks and Open Space Authority) and the Local Partners when available, and from other sources where data from local agencies were unavailable<sup>4</sup>. A separate land valuation analysis was used to develop land acquisition cost estimates (see Section 9.3.1 *Land Acquisition* for more detail).

While the Implementing Entity is responsible for ensuring implementation of all of the requirements described in Chapter 8, it is assumed that the Implementing Entity will leverage the resources of Local Partners when possible to use funding as efficiently as possible. As such, it is expected that local land

<sup>1</sup> Costs will vary over the 50-year permit term primarily due to the size of the Reserve System. To predict the general timing of funding needs, costs are summarized by 5-year periods except for Year 0, which contains initial start-up expenses. However, the cost model will be used during implementation to forecast start up costs.

<sup>2</sup> The Lower Colorado River Multi-Species Conservation Plan (approved), the East Contra Costa County HCP/NCCP (approved), and the Placer County Conservation Plan (an in-process HCP/NCCP).

<sup>3</sup> The Consumer Price Index (CPI) for the San Francisco-Oakland-San Jose Metropolitan Service Area from the U.S. Bureau of Labor Statistics was used as needed to increase cost estimating factors during the planning process.

<sup>4</sup> Model cells are color-coded to indicate data sources. See **Appendix G**.

management agencies and other entities will perform many of the functions of the Implementing Entity. In this case, the Implementing Entity will be “outsourcing” implementation tasks to these organizations and paying them to act on the Implementing Entity’s behalf. The costs summarized in this chapter are therefore estimates of expenses incurred by the Implementing Entity or payments to contract agencies, landowners, consultants, or contractors to perform their work.

The assumptions used to develop land acquisition and management costs warrant additional discussion. Several acreage figures appear only in the cost model and do not correlate to conservation strategy requirements. The total size of the Reserve System will be at least 46,496 acres and up to an estimated 46,920 acres (Chapter 5). This includes 33,205 to 33,629 acres of new acquisitions that fulfill specific land cover requirements. However, the cost model assumes that new acquisitions for the Reserve System will total 36,100 acres (**Table 9-2**). This is because the cost model assumes that some “non-target” acres will be acquired in addition to targeted land cover types. For example, an acquired parcel may include land cover types without acquisition, restoration, or creation requirements, such as agricultural or developed land cover types. In addition, up to 13,291 acres of existing open space will be contributed to the Reserve System (**Table 5-5** and **Table 9-2**). Acreages used to estimate management and monitoring costs are based on acreages consistent with the conservation strategy (**Table 9-3**) and do not assume management or monitoring costs for the “non-target” land cover types that are included in the acquisition costs.

Details of each cost category and the key assumptions that were used to develop the Habitat Plan cost estimate are described below. The costs in perpetuity are described in Section 9.3.7 *Costs in Perpetuity*. See the cost model in **Appendix G** for an accounting of all assumptions.

### 9.3.1 Land Acquisition

Land acquisition is the biggest component of overall Plan costs and acres of acquired land provides the foundation for estimating operational (management and monitoring) costs. Land acquisition is needed to develop the Reserve System to: 1) mitigate impacts from public and private sector development authorized by permits issued for the Habitat Plan, and 2) contribute to the recovery of the covered species.

The proposed Reserve System has two integrated land elements:

1. new land that is acquired (in fee or by easement) to meet the conservation strategy requirements described in Chapter 5 and summarized in **Table 5-13**; and
2. existing open space that is managed to support recovery of covered species.

Existing open space areas proposed for enrollment into the Reserve System have been evaluated to ensure that they offer opportunities to achieve notable benefits

for covered species through additional land management. However, these lands were not included in the land acquisition analysis as they are existing open space.

Land acquisition costs include the price of the land or conservation easement, land transaction costs, and initial site improvements required upon purchase.

## Land Acquisition Costs

Land acquisition capital costs, including site improvements, are estimated to be approximately 72% of all capital costs, or approximately \$268 million (**Table 9-1**). This estimate relies on the assumption that 50% of newly acquired lands would be acquired in fee title (as opposed to conservation easement), and that a conservation easement is 80% of the cost of fee title. This assumption of 50% fee title acquisition applies to all acquisitions, except for those on the valley floor. On the valley floor, all lands are assumed to be acquired in fee title. As such, the resulting overall percent of fee title acquisitions is assumed to be 52%. Gifts of land or transfer of a conservation easement associated with a development project may occur and would reduce land acquisition costs. However, for the purposes of the cost estimate none were assumed. **Table 9-2** provides a summary of land acquisition acreages.

For this cost model, fee title land values were based on a review of comparable private market sales of open space lands in Santa Clara County and interviews with appraisers, real estate brokers, and land management agencies active in the region<sup>5</sup> and values based on parcel size categories and location in the study area<sup>6</sup>. The land acquisition cost factors used in this cost estimate range from \$6,000 per acre to \$34,000 per acre. The actual sale price of individual properties over the permit term will vary considerably.

For planning purposes, fee title and conservation easement land acquisitions are assumed to occur evenly through time over the course of the permit term. Land costs are expected to increase over time; mechanisms for addressing these increases are described in Section 9.4 *Funding Sources and Assurances*. Land acquisition and associated costs are expected to be incurred for the first 45 years of the permit term but not beyond it.

Some newly acquired land may need to be stabilized before habitat management, restoration activities, or public access can begin. Site improvements may include demolition or repair of unsafe facilities; repair of boundary fences; repair and replacement of gates; installation of signs (e.g., boundary and landmark signs); road repair and/or removal; and repair and replacement of creek crossings. Cost estimates were based on a cost per acquired parcel basis.

<sup>5</sup> See **Appendix G: Assessment of Open Space Land Sales Used in the Santa Clara Valley Habitat Plan Economic Analysis**.

<sup>6</sup> Parcels sizes were grouped into one of three categories: less than 50 acres, 50–250 acres, and greater than 250 acres. The location analysis was based on the five zones that match those defined for the impact assessment of rural development (Section 4.4.1 *Direct Effects* and **Figure 4-1**).



## Land Transaction Costs

Land transaction costs cover due diligence activities related to parcels considered for acquisition and reconnaissance-level biological surveys (pre-acquisition surveys).

The process of investigating a parcel of land before acquiring it is considered due diligence. This includes costs for appraisal, preliminary title, boundary surveys, hazardous material assessment<sup>7</sup>, and legal description. The model assumes that 25% more parcels will be investigated than will be acquired.

As described in Chapters 5 and 8, pre-acquisition assessments will be required to determine the biological value of any land considered for inclusion in the Habitat Plan Reserve System. Pre-acquisition assessments include surveys for the following characterizations.

- Land cover type.
- Covered species habitat.
- Covered plant occurrences.
- Wetlands and streams (i.e., wetland delineations).
- Covered wildlife populations.
- Landscape linkages and ecosystem functions.

The model estimates the cost of pre-acquisition surveys based on the estimated number of hours per 100 acres required for each type of survey and the cost per hour, including travel costs, for consulting biologists to conduct the surveys.

Land transaction costs are expected only during the first 45 years of the permit term of the Habitat Plan. Land transaction costs will end once the Reserve System has been fully assembled before Year 45 of the permit term.

### 9.3.2 Reserve Management and Maintenance (Including Adaptive Management)

Once lands have been acquired, the Habitat Plan sets out a program to ensure that the reserves are managed to achieve the biological goals and objectives identified in Chapter 5. Support for reserve management and maintenance must be

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<sup>7</sup> A *Phase 1 Site Assessment* is a preliminary investigation to determine if a site might contain hazardous materials. Sites with hazardous materials will be evaluated for potential cleanup; these costs will be weighed against the effect on the Reserve System design should the site not be protected, and a determination will be made whether the site should still be acquired. For costing purposes, it is assumed that sites with positive Phase 2 Assessment results (i.e., sites that may contain hazardous materials) will not be added to the Habitat Plan Reserve System because hazardous material cleanup would be required (sites with hazardous materials with legal mandates for cleanup may still be acquired if they support valuable or unique biological resources).

sufficient to cover the ongoing management and maintenance needs of the Reserve System. These activities are estimated to be \$95,360,000 over the term of the permit, or an average of about \$1,910,000 annually during the permit term (**Table 9-1**). The estimated cost to manage the Reserve System relied on the size of the Reserve System, the number of Implementing Entity staff (or contract equivalent), and the time period of the permit term. Accordingly, these costs are expected to increase with the size of the Reserve System. However, costs will not grow directly in proportion to the size of the Reserve System because per-acre management costs are expected to eventually decrease due to efficiencies of scale. **Table 9-3** provides a summary of the per acre cost of reserve management and monitoring activities over the permit term. Costs estimates related to management and maintenance activities include those listed below.

- Reserve System staff.
- Purchase of passenger and maintenance vehicles, vehicle repair, and fuel (vehicle insurance is included in Program Administration).
- Leasing vehicles or heavy equipment.
- Construction, maintenance, and operation of field facilities (e.g., workshops) and associated equipment.
- Pre-construction surveys for construction of field facilities.
- Purchase of management equipment and materials (e.g., hand-held tools, safety equipment, irrigation supplies, construction materials, etc.).
- Construction and operation of wells and water pumping facilities.
- Habitat enhancement of all natural communities within the Reserve System, focused on improving conditions for the covered species.
- Invasive species control (e.g., use of herbicides or grazing).
- Enhancement of covered plant occurrences.
- Conservation actions specific to western burrowing owl.
- Maintenance of ponds (e.g., dam repair, dredging).
- Adaptive management, including staff time to evaluate the results of monitoring and external research to determine the effectiveness of reserve management. These costs include staff time and equipment needed to adjust management prescriptions to respond to the changing needs of the species and natural communities in the Reserve System as well as implementation of management actions within the adaptive management framework.
- Developing or maintaining grazing infrastructure for conservation actions, including grazing fences, leases, etc.
- Development of reserve unit management plans for each reserve unit (defined in Chapter 5).
- Construction and maintenance of facilities (e.g., fencing, gates, roads, bridges, culverts) and planning activities.
- Environmental compliance requirements (described below).

■ Remedial measures for changed circumstances (described below).

Management activities may be implemented by the Implementing Entity, Local Partner staff, contractors, landowners, or other third parties. Management activities will be undertaken as efficiently as possible given existing constraints. For example, while herbicide application is permitted under the Plan, the County's IPM Ordinance restricts such use. As such, flexibility in how certain management techniques are applied may be limited (depending on the plant species, grazing or prescribed fire may be more cost-effective alternatives).

Adaptive management and maintenance activities within the Reserve System will include any change in the management and maintenance of the Reserve System necessary to meet the goals and objectives described in Chapter 5. These changes will be informed by monitoring described in Chapter 7. Adaptive management and maintenance could include, but are not limited to, enhancement of the permit area through planting, salvage of plants and replanting in a reserve, seed collection for storage in a seed bank, seed bank fees to establish and maintain seed banks, and providing onsite assistance to and oversight of contractors.

As currently designed, the adaptive management decision-making process will be part of the regular duties of Implementing Entity staff. Therefore, costs associated with adaptive management except for external scientific review were assumed to be part of the capital and operational costs of reserve management, including staff time devoted to reserve management.

Reserve management and maintenance employees will have access to the office space of the Habitat Plan Reserve System (covered under the program administration cost category), but their primary office space is assumed to be a field facility. Field facilities are small buildings that will house workshop space, equipment, a manager's office, a shared office for field staff, a locker room, and restrooms. Field facilities also include secure covered parking for maintenance vehicles. The cost for constructing and maintaining the facilities and parking areas is included in the maintenance and management category. The number of field facilities in operation is based on the size of the Reserve System. The estimated cost per year for field facility maintenance and utilities is included for each facility.

Management and maintenance vehicles purchased by the Implementing Entity include four-wheel-drive trucks, all-terrain vehicles (ATV), and ATV trailers. Vehicle and fuel costs are based on the number of each type of vehicle purchased and retired during each 5-year period, the purchase price of each type of vehicle, and fuel and maintenance costs per each type of vehicle per year. Costs are also assumed for renting large equipment as needed including small tractors, loaders, flails, larger tractors, dump trucks, and fire trucks.

The cost for maintenance equipment and materials is based on the estimated cost of equipment and materials per 1,000 acres of reserve per year and the area of reserve in each 5-year period. Maintenance equipment and supplies include but are not limited to hardware, weed control (whips, mowers, flail, herbicide sprayers, seeders), firefighting equipment (e.g., fire pumper, backpack pump,

hand tools), small tools, safety equipment, raingear, small pumps, generators, saws, demolition hammers, cargo containers, water pipes, irrigation supplies, landscape plants, fencing materials (grazing infrastructure), and lumber.

Water will be pumped into existing stock ponds as needed to maintain water levels for their habitat value for covered species and native biological diversity<sup>8</sup>. It is assumed that wells will need to be drilled and pumps will need to be purchased. Water costs are based on the estimated annual cost for well drilling and water pumping per 1,000 reserve acres and the total amount of reserve area in each 5-year period.

Contractors and landowners are expected to be needed for many of the reserve management tasks including but not limited to the following.

- Development of reserve unit management plans.
- Road and bridge construction, maintenance and repair.
- Pond maintenance.
- Major or specialized invasive species management (e.g., pig control, large infestations of yellow-star thistle).
- Preconstruction surveys required in Chapter 6 for management actions that disturb soil (e.g., field facility construction, new fencing).
- Large-scale mowing for fire breaks.
- Fence maintenance and repair.
- Alarm installation and maintenance at field offices.

Involvement of contractors in management planning will likely be higher in the first 5 years of Habitat Plan implementation due to the time required to hire and train Implementing Entity staff and the need for many management plans early in implementation. Implementing Entity staff will be expected to assume most of the management planning work by Years 6–10. Contractor costs are based on the annual amount estimated to be expended for each type of contractor per 1,000 reserve acres and the total amount of reserve area in each 5-year period.

Reserve management and maintenance will be required in perpetuity, although at a somewhat lower level than during the permit term.

## Environmental Compliance

Reserve management activities must comply with environmental requirements as described in Chapter 8 *Plan Implementation*. Additional environmental compliance will be needed during implementation for certain land management

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<sup>8</sup> Constructed ponds will be sited to minimize their need for supplemental water. Reserve System ponds will be constructed outside of the 100-year flood plain. Existing ponds that provide breeding habitat for covered species, if not sited properly, may need supplemental water to be maintained.

and restoration activities within and outside Habitat Plan reserves. Estimated costs are based on average costs for contracting the preparation and submittal of compliance documents and permit applications. Environmental compliance costs are assumed to include compliance with NEPA and CEQA, Sections 401 and 404 of the Clean Water Act (CWA), Section 106 of the National Historic Preservation Act (NHPA), Sections 1600–1607 of the California Fish and Game Code, and other miscellaneous requirements (e.g., county grading permits, road encroachment permits, stormwater pollution prevention plans). Most CEQA and NEPA compliance costs are expected to be addressed by the EIR/EIS for the Habitat Plan. However, additional CEQA or NEPA review may be required for some projects.

Environmental compliance costs are assumed to vary with the type of compliance and the size and complexity of the project. For purposes of cost estimation, Habitat Plan projects are divided into three size/complexity categories.

- Small/simple (up to 10 acres or up to 0.1 stream mile).
- Medium /moderately complex (10.1–50 acres or 0.1–0.5 stream mile).
- Large/most complex (more than 50 acres or 0.5 stream mile).

It is assumed that Section 404 CWA, Section 401 CWA, and Section 1602 California Fish and Game Code permits will be procured on a per-project basis. Because these costs are generally associated with restoration activities, compliance costs for jurisdictional waters impacts are included in *Habitat Restoration, Creation, and Covered Plant Occurrence Creation* described below. NHPA compliance is assumed to cover cultural resource inventory only when needed for projects with a federal nexus (e.g., Clean Water Act Section 404 permits). If significant cultural resources are found at a location subject to disturbance by management, restoration, or other Plan activities, the Plan activities will be relocated.

All environmental compliance costs are expected to be incurred during the permit term because they are associated with initial reserve management actions and habitat restoration/creation projects. Few environmental compliance costs are expected after Year 40 because construction of all restoration/creation projects will be completed by then. The environmental compliance costs of covered activities unrelated to conservation actions will be borne by the applicants and are not included in this cost estimate.

## Remedial Measures for Changed Circumstances

Remedial measure costs are estimated to address the reserve management response to changed circumstances (see Chapter 10 *Assurances* for a description of all changed circumstances and remedial measures). The cost estimate for remedial measures was assumed to be an additional 10% of the operational costs allocated for management activities on reserve lands. Actual allocations for remedial measures will be adjusted each year based on the inflation factors

described in Section 9.4.1 *Habitat Plan Development Fees* subheading *Adjustment of Mitigation Fees*.

The Implementing Entity will maintain sufficient financial reserves to fund remedial actions described in Chapter 10 when they arise. Starting in Year 5 of implementation<sup>9</sup>, the Implementing Entity will annually assess its funding reserves and supplement those reserves in order to fund implementation of the most expensive remedial actions that might occur in the coming 5 years, based on historic events and frequency. Funds used to supplement these financial reserves could come from outside the Implementing Entity or from within the Implementing Entity budget (i.e., funds shifted from other Habitat Plan uses). This approach will ensure that adequate funds are available immediately in the event of a changed circumstance occurring.

Annual funding for remedial measures would accrue each year and annual funding for remedial measures would grow each year in proportion of the size of the Reserve System. The combination of these two factors will lead to substantial remedial measures funding reserves generated later in the permit term. Changed circumstances described in Chapter 10 are more likely to occur on a larger scale later in the permit term due to the greater size of the Reserve System and the expected effects of climate change.

As described in Chapter 10, the Implementing Entity is required to implement remedial action if any of the changed circumstances occur. The cost assumptions are made for planning purposes and will not limit the Implementing Entity's obligation to respond to these changed circumstances. Remedial measures for the Reserve System are not required after the permit term so these costs are assumed to apply only during the permit term.

## Recreation

Recreation is not a requirement of the ESA or NCCP Act. Any recreation activities within the Reserves System will be funded by non-fee funding sources and, as such, potential costs are not reflected in the cost model. However, recreation elements for the Reserve System could include the following.

- Developing or reviewing and integrating recreation sections for each of the five reserve unit management plans (for each of the expected five reserve units).
- Constructing recreational facilities including trailhead parking areas and access roads, kiosks, gates, signage, picnic sites, emergency phones, restrooms, and multi-use trails.
- Maintaining recreational facilities.

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<sup>9</sup> Year 5 is identified as the starting point to ensure adequate funds for remedial measures have accumulated before this time.

However, the Plan includes costs associated with public access as related to law enforcement, such as managing visitor interface with resource management areas, ensuring public safety (see Section 9.3.5, *Program Administration* subheading *Law Enforcement for Public Access*), and fire protection/suppression.

### 9.3.3 Habitat Restoration, Creation, and Covered Plant Occurrence Creation

Habitat restoration and covered plant occurrence creation costs are estimated to be \$92,630,000 over the permit period, on average, \$1,850,000, annually during the permit term (**Table 9-1**). The budget covers activities listed below.

- The cost of identifying and prioritizing potential restoration and creation sites.
- Design of restoration/creation projects.
- Development of plans, specifications, and engineering documents.
- Bid assistance.
- Pre-construction surveys for projects within the Reserve System.
- Environmental compliance (covers permitting for impacts to federal and state jurisdictional waters, and streambed alteration agreements).
- Construction within the Reserve System.
- Construction oversight and monitoring within the Reserve System.
- Post-construction monitoring and maintenance.
- Restoration and creation repair necessary to meet success criteria specified in each reserve unit management plan (monitoring component) and site restoration plans.
- Costs associated with using contractors to assist or do any of the restoration/creation components identified in the bullets above.
- Costs associated with the habitat restoration/creation employees.
- Monitoring and maintenance during and after the permit term.
- Contingency of 15% to account for the greater uncertainty in these costs (contingency costs for restoration and creation actions are independent of, and higher than, costs assumed for the general contingency fund described below in Section 9.3.6 *Contingency*).

Enhancement costs are accounted for above in Section 9.3.2 *Reserve Management and Maintenance (Including Adaptive Management)*. The land cover types that will be restored or created under the Habitat Plan are willow riparian forest and scrub, mixed riparian forest and woodland, Central California sycamore alluvial woodland, coastal and valley freshwater marsh, seasonal wetland, ponds, and streams. **Table 5-16** describes plant occurrences that will be created within the Reserve System. The cost is developed for each 5-year period

based on the area of each land cover type that is estimated to be restored during that period. For planning purposes, the pace of restoration is assumed to be constant during the permit term. The actual pace of restoration and creation activities of the land cover types listed above will comply with the Stay Ahead Provision described in Chapter 8 and the interim timing requirements described in **Table 5-14**. Restoration and creation requirements for covered plants species will always occur prior to impacts, except for the Coyote ceanothus (see Chapter 5, Section 5.4 *Benefits of and Additional Conservation Actions for Covered Species*).

Costs for restoration repair include the costs to replant restoration sites in the event that plantings fail due to site conditions, human error, animal browsing, or other factors. These costs are calculated as 15% of the cost to construct an acre or linear foot for each land cover type<sup>10</sup>. Restoration repair costs are assumed to be unnecessary once the performance standards are met. Restoration repair costs do not include costs associated with remedial measures for changed circumstances, which apply to the destruction of restoration sites from foreseeable natural disasters such as flooding and drought (see Chapter 10). Costs associated with remedial measures to deal with changed circumstances are described below in Section 9.3.2 *Reserve Management and Maintenance (Including Adaptive Management)* subheading *Remedial Measures for Changed Circumstances*.

It is expected that contractors will be hired to construct all but the smallest habitat restoration or creation projects due to the specialized equipment, plant propagation, and planting techniques needed. For large-scale projects, a great deal of labor is typically required (e.g., planting seedlings, cuttings, or container stock for riparian or oak savanna restoration projects), which only a contractor can provide. In addition, it is expected that contractors will be hired to design restoration/creation projects, create restoration/creation plans and specifications, assist with construction bids, conduct pre-construction surveys, oversee the construction of habitat restoration/creation projects, and conduct post-construction monitoring and maintenance. Contractor costs are based on the estimated contract value for each type of contract work for each 5-year period. Staff time, equipment, and vehicles for the Implementing Entity are included in this cost category to account for the time needed to hire and oversee contractor designs, specification, and construction.

Construction of all habitat restoration/creation projects will be completed by Year 40 but restoration costs will be incurred throughout the permit term.

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<sup>10</sup> This percentage is based on the assumptions that restoration repairs will be needed on a minority of restoration projects, and these repairs will be substantially less expensive than the original construction costs. Additional contingency funds (see Section 9.3.6) could also be used to repair restoration projects, if necessary.



### 9.3.4 Monitoring, Research, and Scientific Review

Monitoring, directed research, and scientific review costs are estimated to be over \$30,230,000 over the permit term and on average, \$600,000 annually (**Table 9-1**). Like management costs, monitoring costs were estimated to increase as the Reserve System grows. Per-acre monitoring costs were developed to account for an eventual reduction in cost once staff becomes well trained, protocols are well established, and efficiencies of scale are achieved. Monitoring costs in the first two periods (Years 1 through 10) were relatively larger to account for extra time needed for training staff and working out the details of the monitoring program (e.g., variables measured, monitoring protocols, field equipment, field forms, data analysis, etc.).

The costs of monitoring restoration projects are not included in this cost category so that all restoration costs are reflected in one cost category (and fees on wetland impacts can be more easily calculated). See Section 9.3.3 *Habitat Restoration and Covered Plant Occurrence Creation* above for a description of these unique monitoring tasks and costs.

Monitoring, directed research, and scientific review are described fully in Chapter 7 and **Appendix J**. Monitoring, directed research, and scientific review costs cover the following items.

- Costs associated with Implementing Entity staff conducting some monitoring, directed research, and scientific review.
- Planning, conducting, analyzing, and reporting on monitoring of ecosystems, natural communities, and covered species within the study area.
- Planning, conducting, analyzing, and reporting on monitoring the effectiveness of conservation measures (the cost of monitoring habitat restoration/creation projects is included in the habitat restoration category).
- Monitoring the status of impacted plant occurrences (Chapter 6, Section 6.6.2, subheading *Condition 19 Plant Salvage when Impacts are Unavoidable*).
- California tiger salamander hybridization studies.
- Western burrowing owl population surveys (every 3 years) and other related monitoring.
- Research directed at management and conservation needs of the Reserve System.
- Stipends for Science Advisors and the Independent Conservation Assessment Team in scientific review and meetings.

It is assumed that Implementing Entity employees conducting monitoring, directed research, and scientific review will plan, coordinate, and report on Habitat Plan monitoring. It is assumed that contractors will collect, document, and analyze monitoring data. Contractor costs for collecting monitoring data are based on the estimated number of hours per acre required for each type of

monitoring, the area that will be covered by each type of monitoring in each 5-year period, and the cost per hour for contracting biologists to conduct the monitoring (the cost per hour includes travel costs for the contractors).

Most monitoring and research is expected to occur on the Reserve System, including existing open space identified in Chapter 5 that will be incorporated into the Reserve System. However, some monitoring and research will occur outside the Reserve System in order to achieve the goals of the monitoring program described in Chapter 7. Monitoring costs include a limited amount of monitoring that would occur off the reserves (e.g., along streams and on other public lands to support status and trend monitoring).

Scientific review costs include costs related to scientists serving on the Independent Conservation Assessment Team and scientists providing advice to the Implementing Entity throughout the permit term (see Chapter 7). The Independent Conservation Assessment team is assumed to meet once every five years and a stipend for each of the five members is included in the cost model. An annual stipend for an assumed eight scientists is also included. Stipends for scientists include travel costs. The cost of adaptive management experiments is covered under the cost for directed research and monitoring. The cost of implementing the results of adaptive management recommendations is assumed in the overall cost of reserve management.

All research costs and most monitoring costs are assumed to occur during the permit term. Some monitoring tasks will be required in perpetuity (see Section 9.3.7 *Costs in Perpetuity* for details).

### 9.3.5 Program Administration

Program administration costs are the overhead or indirect costs to support employees, facilities, equipment, and vehicles needed by the Implementing Entity to carry out Habitat Plan requirements. Program administration also includes estimated costs for insurance, legal and financial assistance, law enforcement and firefighting paid to the County and other land management agencies (e.g., County Sheriff, CalFire), and public outreach and education. Program administration costs are estimated to be \$920,000 annually during the permit term (**Table 9-1**). Some program administration costs will be necessary beyond the permit term.

Cost savings in program administration may be realized by partnering with existing land management agencies that already have staff with the required qualifications and have the infrastructure to hire and manage such staff. However, for estimating purposes it is assumed that the Implementing Entity will hire and manage its own staff in its own facilities. This assumption ensures that potential costs of staffing and program administration are not understated.

Administrative costs incurred by Permittees other than the Implementing Entity to fulfill their own responsibilities under the Habitat Plan are not included in the cost

estimates. For example, each Local Partner will incur costs when reviewing applications for take authorization from various project proponents (see Chapter 6, Section 6.3 *Conditions on All Covered Activities*). The participating cities and the County might recover these costs from applicants according to the policies in place at each local jurisdiction. The fee amounts specified in the Plan do not reflect the costs of application review by the local jurisdictions, and revenues from the Habitat Plan fees will not be used to cover these costs. Similarly, the cost of all conditions on covered activities described in Chapter 6 will be borne by the project proponents, either public agencies or private developers.

## Staff

Much of the work identified for staff positions may be accomplished by contract resources including contracts with some of the Permittees, non-profit agencies, landowners, or private entities, especially in the early phase of Plan implementation. It is assumed that the Implementing Entity will have an Administrative Director that can function both as an organizational leader and public presence of the implementation effort. It is assumed that data management and analysis, including GIS work, will be contracted to one of the Local Partners or consultants.

Up to 10.5 staff positions are identified in the cost model for the Implementing Entity. Staffing levels at the Implementing Entity will increase slowly over time as the Reserve System grows and responsibilities increase. Staff positions address administrative needs of the program as well as non-administrative needs of the Reserve System. Other staffing mixes could be used by the Implementing Entity to fulfill the obligations of the Plan; the staffing mix described below was used only for the purposes of the cost analysis.

For the purposes of the cost estimate, it is assumed that the following positions will be staffed as administrative personnel within the Implementing Entity according to the roles described in Chapter 8 *Plan Implementation*: an Administrative Director, a Budget Analyst, a Grant Specialist, a Public Education and Outreach Coordinator, and Administrative Staff (some staff are part-time). These positions are proposed for the type of role that will be required to support implementation of the Plan, but the actual staff hired may not exactly correspond to this proposal. The cost-estimates for administrative staff is almost entirely covered in the Program Administration cost category (the assistant position is shared with Reserve Management and Maintenance). Costs for non-administrative personnel in the positions of Reserve Manager/Senior Scientist, Project Manager/Conservation Planner<sup>11</sup>, and Field Staff are shared between the program administration, reserve management and maintenance, habitat restoration/creation, and monitoring, research, and scientific review cost

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<sup>11</sup> The Project Manager will be managing and coordinating all habitat restoration and creation projects, developing and overseeing contracts and bids, and assisting with Wildlife Agency coordination. Field Staff will be conducting some of the field work necessary to operate the reserve, including conducting management actions, conducting or overseeing monitoring, and assisting with restoration projects.

categories. Staff costs for the Reserve Manager/Senior Scientist<sup>12</sup> are entirely accounted for under the Reserve Management cost category (see Section 9.3.2 *Reserve Management and Maintenance (Including Adaptive Management)* for more detail).

## Office Space and Associated Costs

All costs associated with general office operations are accounted for under the program administration category. General office costs include office space and utilities, office equipment including copy and fax machines, an office telephone system, printers, scanners, publications, digital cameras, and a radio base station.

## Staff and Associated Costs

Staff-specific costs include employee salaries; benefits (identified by a salary multiplier of 35% to include the cost of benefits such as health insurance, payroll taxes, retirement plan, worker's compensation, disability, and life insurance); computers; office furniture; office supplies; cell phones; portable radios; and training. A mileage allowance is provided for all staff. This allowance is based on a mileage allowance per employee per year and cost per mile. Travel costs are based on days of travel per year and per diem allowance per employee.

## Insurance

Insurance costs are an important part of program administration. Insurance costs were included for auto insurance for all Implementing Entity vehicles as well as for professional insurance for the Governing Board members (often known as "directors' and officers' insurance"), general liability insurance to cover public recreational use within Habitat Plan reserves, and professional liability insurance for Implementing Entity staff.

## Legal and Financial Assistance

The Implementing Entity will require legal and financial assistance during implementation. Legal resources will be needed to draft and review conservation easements, finalize land purchases, assist with negotiations, and assist with easement violations if they occur. Financial assistance will also be periodically required to review the program's cost/revenue balance and ensure that Habitat Plan fees are adjusted in line with changing land costs and inflation. Legal costs are based on the billing rate for legal contractors and the estimated time contracted per 5-year period; financial analyst costs are based on the estimated cost for financial analysis services per 5-year period. Attorneys and financial

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<sup>12</sup> The Reserve Manager/Senior Scientist will be responsible for overall management of all reserve lands.

analysts with each local jurisdiction are expected to provide some support to the Implementing Entity.

## Law Enforcement for Public Access

The Habitat Plan Reserve System will increase the need for law enforcement services in Santa Clara County because of the visitor use of the new reserves. To address this impact, the Implementing Entity will pay to cover reserve-related public safety costs on an annual basis. The number of police officers, park rangers, deputies, or peace officers funded per 5-year period is based on the total area projected to constitute designated reserves during the specified period and the predetermined areal extent of reserve that will require the funding of one peace officer.

## Public Outreach and Involvement

The Plan includes an annual budget for the production of education materials that may include brochures; doing mailings; holding special events (e.g., groundbreakings and dedications, volunteer appreciation functions); managing volunteer groups; and otherwise involving the public in the implementation of the Habitat Plan. It is anticipated that a volunteer group of docents will be trained early in Plan implementation and that this group will lead reserve tours and conduct educational/interpretive programs. In addition, the staffing plan includes one part-time education and outreach coordinator to design and manage the outreach program (see Chapter 5 for details of this program).

### 9.3.6 Contingency

To account for uncertainties in costs, a contingency of 3% is included in the model for all costs exclusive of restoration/creation. The contingency fund will be used on a short-term basis to offset any program costs that are higher than predicted by this Plan. Contingency funds are modest because Habitat Plan fees are designed to keep pace with rising Plan costs, particularly for land acquisition (see *Development Fees* below). Contingency funds will be used only when needed to address costs beyond those predicted in this cost estimate and in annual budgets of the Implementing Entity. Contingency funds could be used for:

- buying new or repairing existing equipment,
- acquiring materials not forecast in the budgets,
- adding temporary staff to address new issues,
- acquiring land that is more expensive than planned,
- applying more expensive management techniques in response to adaptive management needs,

- conducting additional monitoring,
- addressing unforeseen administrative costs, or
- other uses.

Adaptive management needs may arise throughout the permit term in response to monitoring results or external data that dictates shifts in management techniques and protocols. Costs for routine adaptive management needs are included in the *Reserve Management and Maintenance* cost category. Additional management needs could be addressed through contingency funding. Contingency funding will generally be used to pay for expected management that simply costs more than budgeted, or for minor adjustments in management that result in higher costs. Because this contingency budget will accrue over time, it is expected to be adequate to supplement the adaptive management budget described above in Section 9.3.2 if necessary. It could also be used to fund other Plan needs.

Contingency costs are assumed to be needed only during the permit term because some Plan costs will disappear (e.g., research) and other costs will drop substantially after the permit term.

### 9.3.7 Costs in Perpetuity

As described above, some costs are expected to be incurred only during the permit term (acquisition, restoration, environmental compliance, remedial measures, and contingency), while others can be expected after the permit term. Because most of the impacts of the covered activities are permanent (see Chapter 4), many of the conservation actions must be implemented permanently. For example, land acquired for the Reserve System must continue to be managed beyond the permit term to ensure that it retains the biological values enhanced during the permit term. Similarly monitoring must continue beyond the permit term to ensure that management actions are effective.

Overall, annual costs beyond the permit term would be about 61% of average annual costs in the final years of the permit term (**Table 9-4**). Many reserve management activities continue beyond the permit term but capital costs for construction services would be eliminated and management planning would be reduced. The costs for directed research, scientific review, and monitoring plans would be eliminated and on-going biological monitoring costs would be at about one-third the level attained by the end of the permit term. Staffing would be reduced from 10.5 FTE to 4.5 FTE beyond the permit term. Estimated annual costs in perpetuity are shown in **Table 9-4**. **Appendix G** describes the assumptions used to estimate these costs.

The funding mechanisms and responsibility for funding costs in perpetuity are discussed under Section 9.4.4 *Funding Adequacy* subheading *Funding for Post-Permit Management and Monitoring*.

## 9.4 Funding Sources and Assurances

Methods for assembling and equitably distributing the costs associated with the Habitat Plan have been the subject of extensive discussion and consideration by members of the public; officials from local, state, and federal agencies; and elected officials. The Habitat Plan, which incorporates the input from this diverse group, offers a balanced approach to conserving species and habitats while equitably distributing the costs.

The Habitat Plan establishes a framework for compliance with state and federal endangered species laws and regulations that accommodates future growth in the study area. Without the Habitat Plan, public and private entities whose activities would affect declining species and their habitats would be required to obtain permits and approvals from USFWS and CDFG before undertaking those activities to mitigate the impacts of their activities on the affected species. To comply with the NCCP Act and thereby obtain necessary permits under CESA, the Habitat Plan also provides for contribution to the recovery (“conservation”) of the covered species. Proponents of private and public development activities will benefit from this comprehensive approach in several ways: they will be assured of take coverage; they will avoid the time and expense of securing their own regulatory approvals; and they will have certainty and predictability with respect to their permit obligations. Consequently, the mitigation fees imposed to implement the Habitat Plan include some of the costs associated with the conservation activities. However, because a variety of groups will directly benefit from the Habitat Plan, those groups will also share in the responsibility for funding and otherwise implementing the Habitat Plan. This shared responsibility includes all of the costs associated with Plan implementation described in Section 9.3 *Cost Estimate Methodology*. Therefore, the term “mitigation” does not only refer to Federal mitigation requirements under the Habitat Plan. See Section 9.4.3 *State and Federal Funding* for more discussion regarding funding under the Section 6 program.

Plan funding will come from a number of different sources, which fall into one of several categories.

- **Habitat Plan Fees and Land Dedication.** This source includes private and public sector development impact fees and land dedications. Fees are also charged on specialized impacts such as wetlands (wetland fee) and temporary effects (temporary impact fee).
- **Local Funding.** Land in lieu of fees and non-fee local funding will complement fee-based funding sources. County Parks and some Participating Special Entities, including the Open Space Authority, will provide land (in fee or subject to conservation easements) in lieu of fees<sup>13</sup>. These lands that are contributed in lieu of fees count toward the mitigation component of the Plan. Non-fee local funding will take many forms,

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<sup>13</sup> County Parks would be able to contribute land in lieu of fees as long as there is an assured funding source such as the Park Charter Fund. If the Park Charter is not renewed, this local funding source would not be available for land acquisition.

including continued and new investments in conservation actions and land acquisition by organizations such as County Parks, the Open Space Authority, SCVWD, and local land trusts that are consistent with the Plan. Additional funding is also expected from local foundations. These non-fee local funding sources (i.e., lands that are not contributed in lieu of fees) cannot be used for mitigation purposes and will be directed towards the NCCP portion of the Plan (i.e., contribution to recovery).

- **State and Federal Funding.** This source includes federal and state grant programs (e.g., USFWS grants under Section 6 of the ESA, Wildlife Conservation Board grants, and state bonds). Some of these funding sources are generally available throughout the state and nation, while others can only be used to implement an approved HCP or NCCP. State and federal funding can only be used for portions of the Plan that contribute to species recovery (not for mitigation), unless a state agency seeks permit coverage under the HCP as a Participating Special Entity (see Section 8.4 *Participating Special Entities*).
- **Interest Income.** The Implementing Entity is expected to gain limited income from interest on revenue not yet spent, plus more substantial revenue from interest on the endowment as it grows prior to its use to fund costs in perpetuity after the 50-year permit term.

**Table 9-5** summarizes the expected revenues and their sources over the permit term. Development fee funding will contribute to mitigation of impacts while non-fee funding from local, state, and federal sources will contribute to the conservation needs of the Plan (i.e., the contribution to species recovery). Each funding source is described below. Additional information on funding is provided in the *Santa Clara Valley Habitat Plan Develop Fee Nexus Study (Development Fee Nexus Study)* prepared by Willdan Financial Services and Urban Economics.

## 9.4.1 Habitat Plan Development Fees

This Plan utilizes a variety of private and public development-based fees to fund mitigation that will offset losses of land cover types, covered species habitat, and other biological values. These one-time fees pay for the full cost of mitigating project effects on the covered species and natural communities. Once paid, applicants do not need to find their own mitigation to satisfy state and federal endangered species laws. In addition, these fees should also satisfy all or most of the CEQA mitigation needs for biological resources, as discussed in Chapter 1.

Fees are based largely on the estimated permanent and temporary impacts to land cover types shown in **Tables 4-2 and 4-3**. Land cover impacts are used because land cover is the best predictor of potential species habitat and is applicable to all of the covered species (see Chapter 3, **Tables 3-5 and 3-6**, and the species accounts in **Appendix D**). Impacts to land cover are also used, in part, as the basis of the conservation strategy (see Chapter 5 for details). The following Habitat Plan development fees (development fees) are discussed below.



- Land Cover Fee.
- Endowment Fee Component.
- Plan Preparation Cost Recovery Fee Component.
- Nitrogen Deposition Fee.
- Serpentine Fee.
- Burrowing Owl Fee.
- Wetland Fee.
- Temporary Impact Fee.

This section also describes the process and timing for collecting fees and how fees are adjusted over time.

The following section describes the Habitat Plan development fees, the areas over which they are applied, and how they are calculated. The underlying analysis for the development fee calculations is provided in the *Development Fee Nexus Study*. The development fees used to fund the Plan are summarized in **Table 9-6**. This section also describes the process and timing for collecting fees and how fees are adjusted over time. The Implementing Entity will comply with all applicable provisions of the Mitigation Fee Act as to the deposit, accounting, expenditure and reporting of such fee revenues and any other applicable legal requirements. Exemptions to the fees are described in the following subsections.

## Projects or Activities Not Covered by the Plan

Projects or activities not covered by the Habitat Plan do not pay Habitat Plan development fees. See Chapter 2, Section 2.4 for a list of activities not covered by the Plan. In summary, these non-covered activities including the following:

- Existing development at the time of Plan adoption. These areas are considered developed for the purposes of this Plan and are not the focus of conservation actions for natural communities and covered species.
- Private sector activities that do not require a permit from a local jurisdiction as described in Chapter 2.
- Lot line adjustments (this is not covered by the Plan because it results in no impacts to covered species).
- Activities that are excluded from coverage because they do not meet the criteria in Chapter 2, Section 2.3.2, subheading *Private Development Coverage Areas*. These non-covered projects may opt into the Plan at the discretion of the local jurisdiction in consultation with the Implementing Entity.
- Projects for which a project proponent provides written confirmation to the Implementing Entity that the CDFG and USFWS have determined that the activity is not subject to CESA and ESA; or has already received the

necessary take authorizations under CESA and ESA; or has otherwise complied with CESA and ESA. An activity will be deemed to be in compliance with CESA and ESA by the Implementing Entity and thus be exempt from the conditions in Chapter 6 and otherwise comply with the Habitat Plan if the proponent provides the following:

1. Letters from both USFWS and CDFG that specifically refer to the activity and state that the activity is not likely to result in take of any federal or state listed species and will not preclude successful implementation of the conservation strategy for all covered species, or
2. A copy of an incidental take permit issued by CDFG for the activity, and copies of incidental take statements or incidental take permits issued by USFWS that authorize the incidental task associated with the proposed activity.

## Exemptions from Development Fees

All development that occurs on land mapped by the Habitat Plan as “urban-suburban”, “landfill”, “reservoir”, or “agriculture developed” land cover types (see Chapter 3 for land cover type descriptions) is exempt from development fees<sup>14</sup>, with the exception of the nitrogen deposition fee and burrowing owl fee, if it is not located in or adjacent to a parcel that contains a stream, riparian woodland or forest, wetland, pond, or serpentine. If new vehicle trips are generated, the nitrogen deposition fee described below may be assessed (**Table 9-7b**). These impacts are not tracked or reported by the Implementing Entity.

The category “reservoir” excludes dams, which are subject to Habitat Plan fees. Barns, corrals, ranch homes, and other small patches of existing development were not mapped as these four exempt land cover types because they fell below the 10-acre minimum mapping unit. These sites would also be exempt from the same development fees and not tracked or reported by the Implementing Entity as long as project proponents demonstrate that they were existing at the time of Plan adoption through air photos or other documentation.

Similarly, implementation of conservation actions described in Chapter 5 (or otherwise consistent with the Plan’s conservation strategy) in or outside the Reserve System are not charged development fees. They will however be tracked as impacts by the Implementing Entity and reported as supporting the conservation strategy. Most of the adverse effects associated with the implementation of conservation actions are considered temporary.

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<sup>14</sup> Some lands inside the planning limit of urban growth have already been approved for development by local land use agencies. These sites are subject to the Habitat Plan development fee if land use approval is still required. However, as described in Chapter 4, these lands were not included in the impact analysis. Similarly, for the purposes of the revenue estimates, Habitat Plan fees were not assumed to be collected on these sites.

The following covered activities are also exempt from Habitat Plan development fees but are tracked as impacts, count towards the Stay-Ahead requirement, and are reported by the Implementing Entity:

- Urban development covered activities (see Section 2.3.2 *Urban Development* in Chapter 2) in Zones A, B, or C (see Zone definitions below) on parcels less than 0.5 acre as long as the parcel does not contain or is not adjacent to a stream, riparian woodland or forest, wetland, pond, or serpentine.
- Additions to existing structures or new structures that are within 50 feet of an existing structure (e.g., a new garage) that result in less than 5,000 square feet of impervious surface as long as no stream, riparian, wetland, pond, or serpentine land cover types are affected. Expansion is measured based on the existing structure's footprint at the time of Plan commencement. Subsequent additions must be added to the original amount to determine whether this threshold has been crossed.
- Construction of recreational facilities within the Reserve System<sup>15</sup>.

All of these activities exempt from the development fees are still covered by the permits. These exemptions from development fees overlap with the exemptions from conditions on covered activities described in Section 6.2 *Exemptions from Conditions*. Differences arise in some cases where fees will be paid but the covered activity does not have to conduct any or all surveys (see **Table 6-1**).

A verified land cover map (see Section 6.8.2 *Item 2: Project Description and Map*) and the Fee Zone map (described below) included in the final Habitat Plan will be used to determine which areas are not subject to the land cover fee. If a project proponent or a Permittee wishes to contest the mapped extent of the exempt land cover types on a parcel or project site, the Permittee (or the Implementing Entity in the event that a Permittee contests the mapping) may consider evidence provided by the project proponent documenting the land cover type on the site prior to Plan adoption. Evidence provided by project proponents is subject to review by the local jurisdiction and the Implementing Entity in accordance with the mapping methods described in Chapter 3. Any deviations from the Habitat Plan land cover map and associated fees must be approved by the local jurisdiction and the Implementing Entity.

## Determination of Development Fees

New development will pay a share of the costs of implementing the Habitat Plan consistent with mitigating the impacts of development activities.

The analysis takes into account that fees will vary to reflect the actual impact of a development project or public infrastructure project. This variation will be

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<sup>15</sup> Instead of paying a fee for construction of infrastructure within the Reserve System, new disturbance for infrastructure does not count toward land cover type land acquisition requirements in Chapter 5, but it does count toward the total Reserve System size requirements.

applied through the use of development fee zones, as described below. The Habitat Plan development fees were established to meet the following criteria.

- Fees will assist in meeting both ESA and NCCP Act requirements.
- Fees generate sufficient funding to offset a proportionate share of Habitat Plan costs.
- Fees are consistent with the general level of biological impact associated with projects in different areas.
- Fees compare favorably with the actual or expected future cost of ESA and CESA permitting on a project-by-project basis, including the costs of uncertainty and project delays.

## Land Cover Fee

The primary component of the Habitat Plan development fees is a *land cover fee*. This fee is based on the mitigation of new development's impacts on land cover types at the project site (see below for calculation methods). The basis for the land cover fee is that the primary impact to the covered species is through the direct and indirect loss or degradation of their habitat (see Chapter 4 and **Appendix D** for details on effects to each covered species). Because habitat for covered species is so closely tied to land cover types (see Chapter 3 and **Appendix D** for details), the primary component of the development fee is associated with impacts to land cover types.

Public and private covered activities are subject to the land cover fee for permanent impacts on any land cover type besides urban-suburban, landfill, reservoir, or agriculture developed (a fee for temporary impacts is described below in this section).

Land cover fees tied to the project footprint are designed to address the direct loss and degradation of covered species habitat and natural communities. This fee will vary by geographic location in the permit area, as defined by three fee zones, to account for broad geographic differences in habitat impacts.

## Land Cover Fee Zones

As described in Chapter 4, impacts on covered species and natural communities vary according to whether projects occur within existing urban development, in cultivated agricultural areas (mostly in the Santa Clara Valley floor), or in natural land cover types. To account for these differences in impact, the land cover fee will vary based on project location.

Unlike the other development fees, the land cover fee varies by location. Three *Fee Zones* are defined by a map that determines the land cover fee paid by development (**Figure 9-1**). The Fee Zone map was developed based on the land

cover mapping in the Plan. These three zones correspond to the dominant land cover types, conservation value, and open space value within each Fee Zone.

- **Zone A: Ranchland and Natural Lands<sup>16</sup>.** Land within Zone A is strongly dominated by natural land cover types including grassland, oak woodland, and chaparral (**Figure 9-2**). Land uses in Zone A are mostly ranchland, low-density rural development, or public open space. Zone A occurs mostly outside of the Santa Clara Valley floor within the Diablo Range and the Santa Cruz Mountains and adjacent foothills. Development in this zone is expected to have, on average, greater effects on more covered species and natural communities than in other zones.
- **Zone B: Mostly Agricultural and Valley Floor Rural Residential Lands.** Zone B is strongly dominated by agricultural land cover types such as grain, row-crop, hay and irrigated pasture, disked/short term fallowed, orchards, and vineyards (**Figure 9-2**). Zone B also includes much of the rural residential land cover in the study area. Zone B occurs in the Santa Clara Valley exclusive of areas mapped by the Habitat Plan as having urban land cover types. Small adjacent valleys such as the Almaden Valley also contain small areas of Zone B. In general, covered activities that occur in this area have an effect on covered species and natural communities, but to a lesser extent than in Zone A.
- **Zone C: Small Vacant Sites.** Zone C includes specific sites that meet all of the following criteria:
  - ❑ Undeveloped sites (all land covers except urban-suburban, landfill, reservoir or agriculture developed).
  - ❑ 0.5 to 10.0 acres in size (parcels less than 0.5 acres are exempt from the land cover fee).
  - ❑ Surrounded on four sides by one or more of the following land cover types: urban-suburban, landfill, or agriculture developed.
  - ❑ Has no stream, pond, wetland, riparian, or serpentine land cover type within the site.

Sites must meet these four criteria in order to be eligible for the Zone C fee. Similar sites that do not meet all of the four criteria above pay the Zone A or Zone B land cover fee. Development of these areas will result in loss of open space and some habitat values, but impacts will be less than those in Zone B and substantially less than those in Zone A because these areas are already surrounded by development.

**Table 9-7a** lists the land cover fee by Fee Zone. The land cover fee includes components for recovering the costs of preparing the Habitat Plan and for developing an endowment fund for post-permit management and monitoring costs, in addition to Habitat Plan costs during the permit term. The Plan preparation and endowment fees are described in more detail below.

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<sup>16</sup> Fee zone names are provided only as a general guide to the dominant land cover. The fee amount will be determined solely by a parcel's location within a Fee Zone mapped on **Figure 9-1** and the verified land covers present on the site.

Parcels that span more than one Fee Zone will pay fees according to number of project acres in each zone. Prior to implementation, the Implementing Entity will provide each Permittee with detailed Fee Zone and land cover maps to allow local agency staff to process and evaluate applications for Habitat Plan coverage or evaluate their own projects under the Plan. Habitat Plan fees will be adjusted over time to account for inflation (or deflation) according to the methods described below under *Adjustment of Mitigation Fees*.

If a project is located in an area mapped as Zone A or B, the project applicant may provide sufficient information (as required in Section 6.8.3 *Item 3: Land Cover Types on Site*) for the local jurisdiction to determine that a Zone C fee is warranted, or if no land cover fee is required. The Implementing Entity may periodically update the Fee Zones (**Figure 9-1**) as necessary (e.g., when fee adjustments may occur).

### Calculation Method of Land Cover Fees

The land cover fees applied in Zones A, B, and C (**Table 9-7a**) were developed to address the Plan's protection, restoration, creation, management, and monitoring costs in the Habitat Plan. The mitigation costs are divided by the projected acres of land impacts to determine the mitigation cost per acre. In the calculation of the acreage of land impacts, impacts in Zone B and C are weighted lower, relative to impacts in Zone A, reflecting the lower average habitat value of land in Zones B and C. The land cover fees for Zones B and C are based on the estimated per-acre effects of development on covered species for each zone, relative to Zone A. Per acre impacts in Zone B are weighted at 69% of impacts in Zone A. Per acre Zone C impacts are weighted at 25% of Zone A impacts.

As described below, mitigation costs per acre of impact to serpentine land cover types are higher than the mitigation cost per acre of impact to other land covers. Therefore, the additional costs of impacts to serpentine land covers are included in the nitrogen deposition and serpentine fees, and are not included in the land cover fees. The land cover fees were determined through the following steps:

1. The share of the reserve acreage that is required to mitigate development impacts was determined by applying a preservation ratio to the number of acres of each land cover type projected to be impacted by development, resulting in the acreage required for mitigation for each land cover type. Preservation ratios vary from 4.0 acres preserved for every impacted acre for the most sensitive land covers, such as serpentine land cover types, to 1.0 or less for land cover types with lower habitat value, such as ruderal or disturbed areas. The preservation ratios are consistent with previously accepted mitigation ratios for projects analyzed on a project-by-project basis outside the Habitat Plan. The share of total Plan costs (**Table 9-1**) associated with the land cover fee exclude costs associated with impacts on wetlands and burrowing owl habitat because these costs are funded by separate fees (see relevant subsections, below). The remaining amount of total Plan costs were allocated between Plan activities associated with serpentine versus non-serpentine land cover types to enable calculation of separate fees for impacts based on these two categories of land cover types.

2. After deducting for costs associated with nitrogen deposition (funded separately by the nitrogen deposition fee) and revenue from the temporary impact fee, the share of total Habitat Plan costs related to development mitigation on non-serpentine land cover types were divided by the total projected impacted acres on land cover types in Zone A, B, and C, weighted by fee zone, to determine the mitigation cost per impacted acre, at the most significant level of impact. This cost per acre is the Zone A land cover fee. The Zone B and C land cover fees are set based on the Zone A land cover fee, using the weighting factors for each zone.
3. Weighting factors for the Zone B and C fees were derived based on the relative habitat and landscape linkage values to the covered species within each zone, the proportional contribution of covered activities within each zone to direct and indirect impacts (including watershed-level effects such as impervious surfaces), and the relative cost of conservation actions within each zone.

## How to Calculate the Land Cover Fee

The land cover fee is calculated differently depending on whether a covered activity is located inside or outside of the urban service area. Each situation is described in the following sections.

### Inside the Urban Service Area

Within the urban service area, land cover fees on private and public projects will be assessed on the development area (see **Figure 6-1**) except for land designated with a land use of Urban Development or Rural Residential (see **Figure 2-2**) on a parcel that is less than 10 acres in which case, the land cover fee is assessed on the entire parcel. The fee will not be paid on any land set aside for the Reserve System (i.e., conservation easement) or for stream setback that is avoided. Fees assessed based on the parcel will be assessed on the entire parcel regardless of how much land disturbance is proposed at the time of the permit application to the local jurisdiction (i.e., regardless of the project footprint). One exception to this is linear public projects (e.g., in stream and utility corridors), which will be assessed the land cover fee based on the project footprint<sup>17</sup>. In these cases, the project footprint for the purposes of assessing the land cover fee is defined as the area where ground disturbance is conducted or vegetation removal occurs. Another exception is that contiguous areas (irrespective of parcel boundaries or ownership) that are 10 acres and larger (for serpentine land cover, 3 acres and larger) and protected by an easement that precludes development are not required to pay Habitat Plan fees. These lands would not necessarily be incorporated into the Reserve System.

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<sup>17</sup> As described above, conservation actions will not be charged development fees, including within stream corridors because they support Plan implementation.

Charging the land cover fee on the entire parcel is justified because little or no habitat value for covered species is expected to remain within the urban service area once all covered urban development occurs, with the exception of creek corridors or areas where only a portion of a large parcel is developed, due to habitat removal, disturbance, and fragmentation and severe indirect and adverse effects (see Chapter 4 for more details on the mechanisms and magnitude of these effects). If subsequent covered activities are proposed on the same parcel, the land cover fee is not charged again (a separate wetland fee may be charged if the second project directly affects a stream, wetland, or riparian area and the wetland fee was not paid previously; see below).

## Outside the Urban Service Area

Outside the urban service area, the land cover fee will be assessed on private and public projects based on the development area, as defined in Chapter 6, Section 6.4.4, subheading *Condition 7 Rural Development Design and Construction Requirements* (also see **Figure 6-1** for an illustration). The development area is roughly equivalent to the project footprint but includes a 50-foot buffer around permanently disturbed areas and a 10-foot buffer around temporarily disturbed areas. If a subsequent project is proposed on the same parcel, permanent impact fees will only be paid on areas for which permanent impact fees were not previously paid. Land cover fees are paid on the entire development area, even if certain areas are avoided within the development area.

## Stream Setbacks

Lands in the stream setbacks required by Condition 11 *Stream and Riparian Setbacks* in Chapter 6 that are avoided (i.e., not directly impacted by the project) are not subject to the land cover fee. If the development is granted an exception or exemption to the stream setback (see Chapter 6, Section 6.4.6, subheading *Condition 11 Stream and Riparian Setbacks*), the project proponent will be charged the applicable Habitat Plan development fees over the entire development area including the affected setback (the unaffected setback is not charged the development fee).

## Endowment Fee Component

As described under *Costs in Perpetuity*, above, the Reserve System will require management and monitoring after the permit term. To guarantee funding for these post-permit costs, an *endowment fee component* will be charged as part of each fee (land cover, nitrogen deposition, serpentine, burrowing owl, wetland mitigation, and temporary impact fees), will be charged and gradually accumulated during the permit term. By the end of the permit term the endowment will be large enough to generate revenue from investment returns that will cover all estimated post-permit costs.



The Habitat Plan cost model estimated that costs for post-permit Reserve System management and monitoring will be approximately \$2.9 million annually, in 2010 dollars (see Section 9.3.7 *Costs in Perpetuity*). An endowment fund model was constructed to estimate the revenue needed during the permit term to support this need at the end of the permit term.

Based on the endowment model, an endowment fund of approximately \$90 million in 2010 dollars would be needed at the end of the permit term to generate average real returns (i.e., inflation-adjusted) of \$2.87 million annually (plus \$60,000 annually for areas with wetland mitigation). This revenue would be sufficient to fund post-permit term Reserve System management and monitoring, including accounting for inflation after the permit term.

Annual returns on endowment fund balances were assumed to equal 3.25%. This key assumption was based on a current habitat endowment management program operated by the National Fish and Wildlife Foundation (NFWF) under agreement with the California Department of Fish and Game. The 3.25% annual real rate of return is net of NFWF administrative fees. This assumption was corroborated by the County of Santa Clara Finance Agency based on their fund management experience.

The endowment fee will be collected from public and private development fee payers over the 50-year permit term. Assuming fee revenue to the endowment fund accrues evenly over the permit term, annual endowment revenues of \$720,000 (plus \$10,000 for areas with wetland mitigation) would be needed to, with interest, build a \$90 million balance in the endowment fund at the end of the permit term. Over 50 years, endowment fee revenue of \$37 million would be needed. This is equal to approximately 11.7% of projected revenue from the development fees (12.2% for areas with wetland mitigation). Therefore, the endowment fee component is set at 11.7% or 12.2% of each development fee, (with the higher rate applied to the wetland fee). **Table 9-8** shows the calculation of the endowment fee component.

The endowment fee component may be adjusted based on the change in the CPI from the U.S. Bureau of Labor Statistics for the San Francisco–Oakland–San José Metropolitan Area, as described under *Automatic Adjustment of Fees*, below. An evaluation of the fund balance in the endowment fund and the fund's investment performance will be conducted every 5 years as part of the fee assessments described under *Periodic Assessment and Adjustment of Fees*, below. This evaluation will assess the adequacy of the current endowment fund balance and projected future endowment fee revenue for funding perpetual management costs. Based on this evaluation, the endowment fee component may be increased or decreased so that the projected balance of the endowment at the end of the permit term will be sufficient to fund reserve management and monitoring costs in perpetuity.

## Plan Preparation Cost Recovery Fee Component

All of the Plan's development fees include a component to partially reimburse the Local Partners over time for the costs incurred to develop the Habitat Plan between 2005 and 2011. The *plan preparation cost recovery fee component* (also called the plan preparation fee component) includes only the Plan preparation costs funded by the Local Partners. This fee does not include the costs funded by the Section 6 Planning Grants from CDFG.

Only the Plan preparation costs related to mitigation of the impact of covered activities were included in the plan preparation fee. We estimated that the cost of preparing a regional conservation plan that only meets the mitigation requirements (i.e., only includes actions to mitigate covered activities) would have been 80% of the preparation cost of the Habitat Plan.

**Table 9-9** shows the calculation of the Plan preparation cost recovery fee component. As shown, the Plan preparation costs allocated to mitigation of covered activities were estimated at \$4.2 million, or 1.4% of projected development fee revenue. Therefore, the Plan preparation cost recovery fee is set at 1.4% of each of the Plan's development fees. The Local Partners will not pay the Plan preparation cost recovery fee component for their covered activities. Instead the Local Partners will be reimbursed for the fair share of plan preparation costs associated with private development and special participating entities that did not contribute funding for preparation of the Plan.

## Nitrogen Deposition Fee

The *nitrogen deposition fee* addresses indirect impacts of covered activities and is based on the Habitat Plan costs related to mitigating the impacts of airborne nitrogen deposition. As described in Chapter 4, serpentine grassland and serpentine covered species in the study area are particularly sensitive to deposition of airborne nitrogen compounds generated by air pollution resulting from vehicles and other sources. These nitrogen compounds enter ecosystems as nitrogen fertilizer. This increased soil fertility favors nonnative annual grasses over native plant species found in serpentine soils. One native serpentine plant species, the dwarf plantain, is the host plant for the Bay checkerspot butterfly, a key covered species in the Habitat Plan. Serpentine plants covered by the Habitat Plan that will be adversely affected by on-going nitrogen deposition include Metcalf Canyon jewelflower, most beautiful jewelflower, smooth lessingia, Tiburon paintbrush, and fragrant fritillary.

It is expected that serpentine lands in the Reserve System will have higher average per-acre costs for reserve management and monitoring than the average costs for non-serpentine land covers. These higher costs result from the number of covered species occurring in serpentine land cover types<sup>18</sup> and the costs of

<sup>18</sup> At least seven covered wildlife species (**Table 3-5**) and eight covered plants (**Table 3-6**) occupy one or more serpentine land cover types for all or part of their life-history.

managing serpentine reserve lands to prevent the intrusion of nonnative species as a result of nitrogen deposition and other threats. The nitrogen deposition fee includes the management and monitoring costs for serpentine lands acquired as mitigation, over and above the average management and monitoring costs that would be required for the same number of non-serpentine acres.

In addition to serpentine grassland, 13 other land cover types in the Reserve System have been identified as sensitive or potentially sensitive to nitrogen deposition (California Energy Commission 2006). As with serpentine land cover types, the adverse effects of nitrogen deposition are expected to increase management costs in these land cover types in order to mitigate these effects (e.g., increased invasive species control). For land cover types known to be sensitive to nitrogen deposition<sup>19</sup>, 20% of the estimated mitigation costs are assumed to be related to nitrogen deposition effects. For land cover types that may be sensitive to nitrogen deposition<sup>20</sup>, 10% of the estimated mitigation costs are assumed to be related to nitrogen deposition effects. Both estimates are considered conservative and account for the uncertainty on specific effects. Again, base mitigation costs were estimated using typical mitigation ratios for each land cover type.

Air pollution simulation modeling was conducted to estimate the percentage of nitrogen deposition in the habitat areas that results from air pollution emissions within the Habitat Plan study area, as opposed to air pollution that is transported from other regions to the study area (see summary in Chapter 4 and the technical report in **Appendix E**). The modeling estimated that 46% of nitrogen deposition on habitat areas comes from existing development and vehicle traffic generated locally within the study area. The study area share of nitrogen deposition on habitat areas is estimated to increase to 49% in 2035 and 51% by the end of the permit term in 2060. Based on this analysis, 50% of the Habitat Plan costs related to mitigating nitrogen deposition impacts are allocated to development in the study area through the nitrogen deposition fee.

**Table 9-7b** lists the nitrogen deposition fee, which is applied to all Fee Zones in the same way. The nitrogen deposition fee will be assessed as a fee per new daily vehicle trip over existing conditions. **Table 9-10** shows the derivation of the nitrogen deposition fee. The Local Partners may substitute an alternative revenue source for the fees that would otherwise apply to new vehicle trips.

While nitrogen emissions come from a variety of sources that include vehicles, it is not feasible at this time to charge a fee on major non-vehicle sources of nitrogen (e.g., point sources such as power plants and industry). As shown in **Table 9-10**, the cost of management and monitoring for serpentine mitigation acres over and above management and monitoring costs for an equivalent number of non-serpentine acres is approximately \$5.3 million. The non-serpentine mitigation costs related to nitrogen deposition are approximately

<sup>19</sup> Land cover types known to be sensitive to nitrogen deposition are northern mixed chaparral, northern coastal scrub, mixed oak woodland, foothill pine-oak woodland, mixed evergreen forest, and redwood forest.

<sup>20</sup> Land cover types that may be sensitive to nitrogen deposition are California annual grassland, valley oak woodland, blue oak woodland, coast live oak forest and woodland, freshwater marsh, seasonal wetland, and pond.

\$14.9 million. Because approximately 50% of nitrogen deposition on these habitats results from nitrogen emissions in the study area, 50% of the costs related to nitrogen deposition are allocated to the study area and are included in the nitrogen deposition fee.

## Serpentine Fee

Plan actions required to mitigate impacts to serpentine land cover types are substantially more costly than mitigation actions for impacts to other land cover types. To reflect the higher mitigation costs, an additional serpentine fee will be assessed on direct impacts to serpentine land cover types: serpentine bunchgrass grassland, serpentine outcrops and barrens, serpentine seep, and mixed serpentine chaparral. This fee is in addition to the land cover fee described above.

Mitigation for serpentine impacts is particularly costly because per-acre land acquisition, management, and monitoring costs are higher for serpentine than for other land covers. In addition, the preservation ratio for serpentine is higher than for other land cover types in the study area.

Per-acre costs for serpentine mitigation lands are expected to be higher than the average cost for other reserve lands because it is expected that serpentine lands will primarily be acquired through acquisition of parcels in the 50 to 250 acre size range. Overall, the majority of land acquired for the Reserve System is expected to be parcels over 250 acres, and it is expected that the per-acre acquisition cost of these larger parcels will be less than the costs of 50- to 250-acre parcels (see **Appendix G** for details).

Mitigation costs per acre of impact are also higher for serpentine land cover types than for other land cover types because higher preservation ratios are typically required for impacts to serpentine than for impacts to other land covers. The preservation ratio to mitigate serpentine impacts is assumed to be 4.0 acres preserved for each acre of impacts, compared to mitigation ratios of 0.5 to 3.0 for other land cover types in the study area.

The serpentine fee was calculated using the same method described above in the *Calculation Method of Land Cover Fees* subsection. The only difference is that in step 2 of the method described in that subsection, serpentine costs and acres of impacts on serpentine land cover types are used to calculate costs per acre of impact, instead of non-serpentine costs and acreage. As described in that step, additional costs related to nitrogen deposition on serpentine land cover types are deducted before making this calculation because these costs are allocated to the nitrogen deposition fee (described above). As described under *Nitrogen Deposition Fee*, above, serpentine lands also have higher management and monitoring costs than other land cover types in the Reserve System.

The serpentine fee will be imposed based on the acreage of impacts to serpentine land cover types as mapped in the field (see Section 6.8.3 *Item 3: Land Cover Types on Site*). In the fee schedule (**Table 9-6**) the serpentine fee is calculated as the additional cost over and above the land cover fee so the serpentine fee is imposed in addition to the land cover fee. The serpentine fee is also imposed in

addition to the nitrogen deposition fee that would apply to the project because the cost of nitrogen deposition impacts are accounted for separately in the nitrogen deposition fee. The serpentine fee will be adjusted over time to account for inflation (or deflation) according to the methods described below under *Adjustment of Mitigation Fees*.

## Burrowing Owl Fee

If a covered activity occurs in occupied burrowing owl nesting habitat as defined in **Figure 5-11**, a *burrowing owl fee* will be paid by the project applicant. This fee will be in addition to the land cover fee. The burrowing owl fee is charged on the area on which land cover fees are levied. A portion of the fee may be waived if a portion of the site is set aside in a conservation easement or management agreement with the Implementing Entity to manage the site for burrowing owl habitat consistent with the Habitat Plan. In these cases, the burrowing owl fee will not be charged on the portion of the site subject to the easement or management agreement.

The burrowing owl fee was determined by the cost to implement conservation actions specifically designed for the western burrowing owl (see Chapter 5, Section 5.4.6 *Western Burrowing Owl* subheading *Burrowing Owl Conservation Priorities*) and the estimated impacts to occupied nesting habitat (see Chapter 4, Section 4.6.4 *Western Burrowing Owl*). These costs are itemized in **Appendix G**. The fee of \$50,438 per acre was calculated by dividing the costs of the conservation actions, plus remedial and contingency funding needed for the burrowing owl conservation strategy, by the expected impacts to occupied nesting habitat (198 acres), plus endowment and Plan preparation costs  $((\$8,570,000 + \$260,000)/198) + \$5,218 + \$624$  (**Table 9-6**).

The burrowing owl fee will be adjusted over time to account for inflation (or deflation) according to the methods described below under *Adjustment of Mitigation Fees*. The burrowing owl fee will be imposed on impacts to occupied nesting habitat based on the most recent modeled habitat map maintained by the Implementing Entity.

## Example Development Fee Calculations

**Example 1 (urban project 1):** A project is located in an area mapped by the Habitat Plan as “urban-suburban” (i.e., existing developed area). The project site does not contain, and is not adjacent to, streams, riparian areas, wetlands, ponds, or serpentine. The site is also not in burrowing owl nesting habitat. Because the project is located on an exempt land cover type, it does not pay the land cover fee. The nitrogen deposition fee is calculated by multiplying the estimated new vehicle trips (i.e., daily trips generated above the pre-project condition) by the per-vehicle-trip nitrogen deposition fee in **Table 9-7b**.

**Example 2 (urban project 2):** A landowner of a 1.2-acre parcel in Gilroy wants to build a new single-family home on most, but not all, of the parcel. The parcel is within Zone B (**Figure 9-1**). The land cover fee is calculated by multiplying the total parcel size, 1.2 acres, by the Zone B per-acre fee in **Table 9-7a**. Because the project is new, it will generate new vehicle trips. The nitrogen deposition fee is calculated by multiplying the estimated new daily vehicle trips by the per-vehicle-trip nitrogen deposition fee in **Table 9-7b**. The two fees are added to arrive at the total Habitat Plan fee for the project, as long as wetlands are avoided (see below). Additional Habitat Plan fees may be assessed as a result of temporary impacts (e.g., leach field construction) and/or impacts to streams and wetlands, as described below.

**Example 3 (rural project):** A landowner of a 40-acre parcel proposes to build a single-family home on 1.5 acres of this parcel. The parcel is located entirely within Fee Zone A (**Figure 9-1**). The base development fee is calculated by multiplying the base fee in Zone A (**Table 9-7a**) times the development area of the project. The development area will be slightly larger than the 1.5-acre project footprint because of the buffer added to the project footprint that accounts for indirect impacts (**Figure 6-1**). Because the project is new, it will generate new vehicle trips. The nitrogen deposition fee is calculated by multiplying the estimated new daily vehicle trips by the per-vehicle-trip nitrogen deposition fee in **Table 9-7b**. The two fees are added to arrive at the Habitat Plan development fee for the project. Additional Habitat Plan fees may be assessed as a result of temporary impacts (e.g., leach field construction) and/or impacts to streams and wetlands, as described below.

## Wetland Fee

Permittees or private project proponents are required to map all wetlands, ponds, streams, and riparian woodland as part of their Habitat Plan Application Package (see Chapter 6, Section 6.8.4 *Item 4: Map of Wetlands, Ponds, Streams, and Riparian Woodlands*). Permittees or private project proponents that impact wetlands, ponds, streams or riparian woodland/scrub will be required to pay an additional *wetland fee* on top of the other development fees. **Table 9-11** lists the applicable fees on wetland, riparian, and stream land cover types. See below for how to calculate these fees.

The wetland fee is intended to pay the full cost of restoration or creation of these land cover types, including design, implementation, post-construction monitoring, and remediation through the permit term.

As described in Chapter 5, mitigation requirements for wetland, stream, pond, and riparian woodland/scrub impacts include both preservation and restoration/creation. The wetland fee will cover the cost of wetland, stream, and riparian restoration or creation, but not wetland, stream, or riparian preservation. The cost of preservation of these land cover types is included in the land cover fee because land prices will not be significantly affected by the presence of these land cover types, and most restoration/creation will occur on land already owned by the Implementing Entity. Therefore, for every acre of impact on wetlands,

streams, ponds, and riparian woodland/scrub, applicants will pay the appropriate land cover fee (according to fee zone) towards land acquisition and the conservation program as a whole, as well as a wetland fee to cover the costs of successful restoration or creation. Wetland fees vary by wetland type to account for the different costs of restoration and the different mitigation ratios required (**Table 9-11**). **Table 9-11** also lists the accepted methods for determining the area to which the wetland fee applies. See the *Development Fee Nexus Study* for the calculation of wetland fees by wetland type. A wetland map completed by a qualified biologist (see Chapter 6, Section 6.8.4 *Item 4: Map of Wetlands, Ponds, Streams, and Riparian Woodlands*) will assist the local jurisdictions and the Implementing Entity in determining appropriate wetland fees.

## Calculating Fees for Wetland and Pond Impacts

The fees for impacts to coastal and valley freshwater marsh, seasonal wetland, and ponds is calculated by multiplying the applicable wetland fee (**Table 9-11**) by the acres of impact to the wetland or pond. As described in Chapter 6, Section 6.5, subheading *Condition 12 Wetland and Pond Avoidance and Minimization*, covered activities that do not completely avoid indirect effects to wetlands will be considered permanently impacted. The area of indirect effects, as determined by the local jurisdiction or Implementing Entity, will be added to the area of direct effect when calculating fees for wetland and pond impacts. Exceptions to this are described further in Condition 12. If a wetland or pond occurs in a stream, only one of the fees is paid in that section of the stream (i.e., the fee on stream impacts is not additive to the fee on impacts to in-stream wetlands or ponds). The Implementing Entity will determine which fee is to be paid when wetlands or ponds occur in streams. (Typically the higher of the two fees would be paid.)

## Calculating Fees for Stream and Riparian Woodland Impacts

The fee on impacts to streams is calculated by applying the linear distance of stream impact, as measured along the stream centerline, to the stream fee per linear foot (**Table 9-11**). Impacts that occur within the ordinary high water mark of a stream channel will be counted as a stream impact. Impacts that occur on one side of the stream channel will be assessed the fee in the same way as impacts that occur on both sides of the stream channel. As described above, if the stream supports a wetland, only one fee will be paid, as determined by the Implementing Entity.

The fee for impacts to riparian woodland and sycamore alluvial woodland are calculated based on the acres of direct impacts to woodland or scrub vegetation as measured by the outer limit (the side away from the stream) of the tree or shrub canopy (drip line). Impacts to riparian woodland or sycamore alluvial woodland that also affect the stream channel will pay both fees (i.e., the fee on riparian impacts is additive to the fee on stream impacts).

## Aquatic Restoration or Creation Provided in Lieu of Wetland Fee

Unlike other development fees, wetland fees cannot be waived in lieu of land dedication (see *Land Provided in Lieu of Development Fees* below for details). However, project proponents have the option of restoring, managing, and monitoring their own wetland, stream, or riparian mitigation site in lieu of paying all or part of the wetland fee. Project proponents may propose to the Implementing Entity to create, manage, and monitor their own pond mitigation site in lieu of paying all or part of the wetland fee. In both cases, construction of restoration and creation of aquatic features will be initiated prior to or concurrent with construction of the covered activity, the mitigation will be consistent with the requirements of Chapter 5, the site will be protected by a conservation easement<sup>21</sup>, and management and monitoring will be funded in perpetuity. Applicants may propose paying the Implementing Entity to manage and monitor the site after construction is completed. Construction of all aquatic restoration and creation projects must comply with the Stay-Ahead provision of this Plan and must be completed by Year 40, consistent with the requirement for the Implementing Entity to do the same (see Chapter 5).

The Implementing Entity must approve requests to perform aquatic restoration or creation in lieu of paying the wetland fee. The Implementing Entity will evaluate proposals to perform restoration and/or creation in lieu of wetland fees based, in part, on the history of the applicant performing successful wetland restoration elsewhere and whether the restoration or creation project is consistent with the conservation strategy and requirements of the Plan. Restored and created aquatic features must also meet the reserve design and assembly criteria in Chapter 5. In order for the Implementing Entity to approve aquatic restoration or creation in lieu of fees, the local jurisdiction approving the project must secure a guarantee through conditions of approval that the restoration or creation will be implemented and remediated if success criteria are not met. In the case of a Permittee proposing the restoration or creation in lieu of wetland fees, the Permittee must sign an agreement with the Implementing Entity to provide this guarantee. After success criteria are met and the applicant assures funding, the Implementing Entity will assume all management and monitoring responsibility of the restoration or creation site as part of the Reserve System.

To satisfy Clean Water Act Section 401 and 404 requirements, aquatic restoration and creation may also need to be approved by the Corps and Regional Board and meet the success criteria agreed upon by these agencies.

Alternatively, applicants may purchase appropriate wetland restoration or creation credits in a private mitigation bank in the permit area that has been approved separately by USFWS and CDFG and pre-approved to service the Habitat Plan. Currently there are no such banks in the study area, but they may

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<sup>21</sup> As described in Chapter 5, Permittees may implement some stream and riparian restoration projects outside of the Reserve System (i.e., without a conservation easement).



be established. Guidelines for the use of mitigation banks are found in Chapter 8, Section 8.6.2, subheading *Private Mitigation Banks*.

## Temporary Impact Fee

As described in Chapter 2, there are many covered activities that are ongoing and that result in small, localized, temporary impacts on natural land cover types. As described in Chapter 4, the majority of these activities, particularly those within urban areas, will have little or no effect on covered species or their habitats. Some ongoing activities, however, are expected to have substantial temporary impacts on covered species due to their large footprint, location in natural land cover types, effect on local soils or hydrology, or a combination of these factors. Temporary impacts are defined in Chapter 4 as “direct impacts that alter land cover for less than one year and that allow the disturbed area to recover to pre-project or ecologically improved<sup>22</sup> conditions within 1 year (e.g., prescribed burning, construction staging areas) of completing construction.”

Specific temporary impacts are subject to the temporary impact fee (see list below of specific activities subject to this fee). Projects subject to the temporary impact fee will pay the fee in one of two ways.

- If the frequency of the impact over the permit term can be predicted, the applicant may pay the fee for infrequent treatments up front, to address all impacts during the permit term. This discounted fee is calculated as a fraction of the full land cover fee. The total fee will be calculated using the formula below.

$$\text{Temporary Impact Fee} = (\text{Land cover fee} \times \text{development area or project footprint in acres} \times (F + R)) / 50$$

where  $F$  = the number of calendar years in the permit term in which the activity occurs and  $R$  = the number of calendar years expected for the site to return to pre-project conditions (a maximum of 1 year). Temporary impacts are not subject to the nitrogen deposition fee.

The maximum time allowed for a site to return to pre-project conditions will be 1 year from the end of construction. The project proponent must document to the satisfaction of the Implementing Entity that the disturbance and site recovery occurred at or better than the predicted timeline.

OR

- The applicant may pay the full land cover fee (see **Figure 9-1** and **9-7a**) and retain the ability to disturb the area repeatedly during the permit term.

Temporary impacts that occur in the same location repeatedly during the permit term and that pay the full land cover fee will be counted and tracked as a permanent impact. Temporary impact fees paid on a site can be credited

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<sup>22</sup> *Ecologically improved* means that the site functions ecologically better than the functions present on the site prior to ground disturbance.

towards any permanent impact fees that may be required on the same site in the future.

As described in Chapter 8, all or a portion of the temporary impact fee can be waived in exchange for land dedication or aquatic restoration or creation, based on the nature of the impact. The amount waived will be determined by the Implementing Entity on a case-by-case basis according to the rules and principles described in Chapter 8.

Temporary impacts that occur within wetland or serpentine land cover types will be assessed a temporary wetland or serpentine mitigation fee according to the formula shown above, but based on the applicable wetland or serpentine mitigation fee (see **Tables 9-6**). Temporary impacts that occur on occupied burrowing owl nesting habitat, as defined in **Figure 5-11**, will also pay a temporary impact fee according to the burrowing owl fee.

Applicants have the option of developing and implementing their own wetland restoration or pond creation project in lieu of the temporary wetland fee. If the applicant's restoration plan is approved by the Implementing Entity, then no temporary wetland impact fee is required. The Implementing Entity will verify that the applicant's wetland restoration and/or creation project is constructed according to specifications and that the project meets its success criteria.

## **Activities Not Subject to the Temporary Impact Fee**

To reduce administrative costs, temporary impact fees will not be assessed on any covered project with impacts of less than 0.25 acre except to wetlands, ponds, riparian woodland, streams, or serpentine.

All covered activities that result in temporary impacts are subject to the applicable conditions described in Chapter 6 and will be tracked against the Plan's impact limits. As described in Chapter 2, some agencies may already have endangered species permits for operations and maintenance activities and will therefore not be subject to the requirements of this Plan or the temporary impact fee (e.g., SCVWD for their Stream Maintenance Program).

The conservation actions described in Chapter 5 and the monitoring actions described in Chapter 7 will not be assessed a temporary impact fee. For example, wetland, stream, and riparian restoration projects conducted for the Habitat Plan may result in temporary impacts. Because these actions support the conservation strategy, they will not be assessed a temporary impact fee.

Mowing of previously maintained flood control channels will have minor impacts and is therefore subject to applicable conditions in Chapter 6 but not subject to the temporary impact fee because the impact analysis assumed these land cover types would be permanently affected during the permit term (these covered activities will pay the appropriate fee prior to impact). Similarly, mowing of existing road rights-of-way that are regularly mowed are subject to applicable conditions in Chapter 6 but not subject to the temporary impact fee.

Sediment removal in artificial off-channel detention basins or groundwater recharge ponds, when free of vegetation, are not subject to temporary impact fees.

### **Activities on Urban Development or Rural Residential Land Uses Inside the Planning Limit of Urban Growth**

Covered activities such as mowing, tree trimming, and other activities resulting in temporary impacts that occur in areas with a land use of urban development or rural residential within the planning limits of urban growth, but excluding San José's Coyote Valley Urban Reserve and South Almaden Valley Urban Reserve, Morgan Hill's Southeast Quadrant, or Gilroy's Hecker Pass, are subject to the conditions described in Chapter 6 but will not be charged a temporary impact fee because the impact analysis assumed these land uses would be permanently affected during the permit term (these covered activities will pay the appropriate fee prior to impact).

### **Activities Subject to the Temporary Impact Fee**

Temporary impacts of any size to wetlands, ponds, riparian woodland, streams, serpentine, or burrowing owl occupied nesting habitat will be charged the appropriate temporary fee regardless of location.

Maintenance of the vegetated portion of on-channel detention basins or vegetated groundwater recharge ponds is subject to the temporary impact fee because these areas are more likely to provide habitat for covered species.

### **Activities Outside the Planning Limits of Urban Growth with Little or No Soil Disturbance**

Covered activities with temporary effects outside the planning limits of urban growth that result in little or no soil disturbance and that are greater than 0.25 acre are more likely to affect covered species than the same covered activities within the planning limits of urban growth. The activities that will be assessed a temporary impact fee for the portion of the project outside the planning limits of urban growth of the participating jurisdictions include, but are not limited to, those listed below.

- Road or trail maintenance along vegetated shoulders where natural land cover types are disturbed or removed.
- Maintenance of public facilities including buildings, utilities, and stormwater treatment where natural land cover types are disturbed or removed.
- SCVWD maintenance activities outside streams, canals, and other facilities (vegetation clearing on dam faces will pay the full land cover fee because it is considered a permanent impact).
- Septic leach fields.

- Vegetation clearing needed for utility line or gas line maintenance (e.g., mowing, disking, herbicide spraying, tree trimming<sup>23</sup>).
- Weed abatement undertaken by Permittees.

Sediment removal in artificial off-channel detention basins or groundwater recharge ponds, when free of vegetation, are not subject to temporary impact fees in the same way as on-channel detention basins or groundwater recharge ponds, as described above. Similarly, vegetation removal conducted by a Permittee to establish a fuel break on private property (e.g., as an enforcement action) is not subject to temporary impact fees.

### **Activities Outside the Planning Limits of Urban Growth with Soil Disturbance**

The following covered activities larger than 0.25 acre include those projects where the area of impact on covered species is larger than the project footprint (e.g., effects on wildlife movement or connectivity). Such activities outside the planning limits of urban growth of the participating jurisdictions include, but are not limited to, those public or private projects listed below<sup>24</sup>.

- Pipeline installation, repair, or replacement (trenching).
- Underground electrical transmission line installation, repair, or replacement.
- Underground telecommunication line installation, repair, or replacement.

The Implementing Entity, in consultation with the project proponent and the Wildlife Agencies, will determine an appropriate project impact area subject to the temporary impact fee. These types of activities may have both temporary and permanent effects (i.e., trenching through a wetland complex that permanently alters site hydrology would be considered a permanent effect). In these cases, the temporary impact fee along with other fees described in this chapter could be assessed. Coverage under the Habitat Plan will also be subject to the approval of the Implementing Entity. As an alternative to devoting time and resources to defining a project impact area, project proponents may choose, in consultation with the Implementing Entity, to pay the full land cover fee on the project footprint in lieu of paying temporary impact fees multiple times during the permit term.

## **Collection of Mitigation Fees**

All fees paid by private applicants to participating jurisdictions will be collected by the applicable jurisdiction. Fees paid to participating local jurisdictions will be transferred to the Implementing Entity on a regular basis, but at a minimum,

<sup>23</sup> Tree removal outside the urban service areas of the participating jurisdictions will be treated as an activity with soil disturbance.

<sup>24</sup> The Permittees do not have jurisdiction over some of the activities in this list. However, these projects could be covered by the Plan through the *Participating Special Entities* process described in Section 8.4.

annually. The transfer schedule and process will be determined by the Implementing Entity early in Plan implementation.

All fees paid by public agencies (i.e., the Permittees) will be paid directly to the Implementing Entity according to a process and schedule developed by the Implementing Entity. See *Timing of Mitigation Fee Payment* below.

## Adjustment of Mitigation Fees

The dynamic nature of the costs associated with HCP and NCCP implementation, including land acquisition costs and operating, maintenance, and management costs, requires a flexible approach to funding through time. Many existing HCPs have not incorporated sufficient flexibility into their funding mechanisms and, as a result, have found that funding lags behind increasing costs, compromising Plan implementation. This Plan includes two mechanisms for adjusting fee levels: automatic adjustments and periodic assessments. Both adjustments will be performed by the Implementing Entity and provided to all participating local agencies.

### Automatic Adjustment of Fees

The two primary costs of the Plan, land acquisition and operations/maintenance, will likely change at different rates over time. Land costs in many areas of California, including the San Francisco Bay Area, have historically increased well above the rate of inflation. The significant demand for housing in the Bay Area and the more limited housing supply have often increased housing prices significantly, in turn increasing the value of developable land. Other Plan costs, including the cost of personnel, supplies, and equipment involved in managing, operating, restoring, and maintaining the Reserve System, will more closely follow the general rate of inflation. To account for these differing rates of inflation, the Implementing Entity will update the development fees automatically on an annual basis by a date determined by the Implementing Entity's Governing Board within the first 6 months of Plan implementation according to the indices and procedures described in **Table 9-12**.

The variation in the cost of land due to site-specific factors means that it is difficult to develop land cost indices; consequently, no such indices are available. However, given the link between the housing market, housing prices, and land costs, housing prices generally provide a more accurate index for land cost inflation than measures of general inflation, especially for land whose value is primarily generated by its development value. The index to be used to adjust the land acquisition cost portion of fees is the annual House Price Index (HPI) from the Federal Housing Finance Agency for the San José–Sunnyvale–Santa Clara, CA Metropolitan Statistical Area for the prior calendar year. The index to be used to adjust the non-land cost portion of fees is the CPI from the U.S. Bureau of Labor Statistics for the San Francisco–Oakland–San José Metropolitan Area. The Implementing Entity may decide to use other indices during Plan

implementation if other indices are developed that better predict the costs of the Plan.

Annual automatic adjustments in development fees will either increase or decrease the total fee per acre. Fees are more likely to go up than down each year. Since 1915 the CPI for this Metropolitan Statistical Area has gone up in 81 of 92 years (88% of the time). Since 1977, the HPI has gone up in this Metropolitan Area in 24 of 30 years (80% of the time).

## Periodic Assessment and Adjustment of Fees

To ensure that the fees generated by development and other covered activities are adequately covering their share of Plan costs, two types of fee reviews will be performed on a regular basis. At least every 2 years, the Implementing Entity staff will analyze the fee amounts and compare them to actual and projected costs. The Implementing Entity staff will then report to the Implementation Board on whether the automatic fee adjustments are keeping pace with actual costs to provide an opportunity to adjust fees different than the automatic adjustments.

In addition, every 5 years a fee assessment will be completed to review the costs and their underlying assumptions that were developed as part of the original funding plan. The review could include comparing appropriate land sales in the study area transacted after the start of the Habitat Plan with the original land cost assumptions (see **Appendix G**). The actual costs of operating, maintaining, and managing the Reserve System can also be compared to the original estimates of these costs to determine the actual change in non-land costs. Automatic annual fee increases will resume after the periodic fee assessment and will continue until the next periodic assessment.

Fees may go up or down depending on the results of the assessment.

## Timing of Mitigation Fee Payment

For private projects, mitigation fees are required to be paid before or at the time the grading permit for the project is issued. If a grading permit is not required, fees must be paid before or at the time the first construction permit is issued<sup>25</sup>.

For public projects, mitigation fees must be paid to the Implementing Entity prior to implementing the covered activity. For public projects conducted by outside contractors, the timing of fee payment may coincide with the award of the construction contract because this represents the time at which the public agency commits to implementing the project.

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<sup>25</sup> A grading permit is typically the first permit issued that results in ground-disturbing activity. In cases where there is no grading permit, the fees will be due upon issuance of the first construction permit (e.g., building permit).

## Land Provided in Lieu of Development Fees

If a landowner or Permittee conveys a portion of the development site (either in fee simple or a conservation easement) to be included in the Habitat Plan Reserve System and the Implementing Entity and the Wildlife Agencies approve the inclusion, the portion of the property included in the Reserve System would not be assessed the land cover, serpentine, burrowing owl, and/or land cover temporary impact fees<sup>26</sup>, as appropriate. Landowners may also provide land separate from development sites for the Reserve System, if approved by the Implementing Entity and the Wildlife Agencies.

In both cases (land provided on or off the covered activity site), landowners or Permittees that convey land to the Implementing Entity may receive credit for the dollar value of these acquisitions against select development fees that might be owed by the landowner or Permittee due to impacts of their covered activities. Land to be conveyed by a landowner or Permittee will be eligible for development fee credit if the land satisfies the criteria described in Chapter 8, Section 8.6.7 *Land Dedication In Lieu of Development Fee*.

### Criteria for Determining Fee Credit for Land Provided in Lieu of Development Fees

The value of the conveyance of land to the Implementing Entity and any credit against development fees will be determined by the Implementing Entity on a case-by-case basis. Any land provided in lieu of development fees must contribute toward the implementation objectives and requirements of the Habitat Plan. In quantifying the credit to be awarded, the Implementing Entity will consider all of the following:

- the extent to which the land would contribute toward the implementation objectives and requirements of the Habitat Plan,
- the fair market value of the land based on an appraisal,
- actual land transactions costs, and
- actual costs of biological survey work performed to provide baseline data for the Habitat Plan, if applicable.

The Implementing Entity will award any credits against development fees from land conveyed after the conveyance has been completed.

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<sup>26</sup> For sites within the urban service area where the entire parcel is charged the development fees, this means that the portion of the parcel dedicated to the Reserve System would have fees waived in that portion. The acquisition and transactional value of the portion dedicated to the Reserve System also provides a fee credit to the portion of the parcel paying the development fees. Covered activities outside the urban service area only pay a fee based on the development area, so portions of a parcel dedicated to the Reserve System would only provide a fee credit to the fees that apply in the development area.

Fee waivers and credits in exchange for land conveyed will only be allowed when the Implementing Entity determines that acceptance of land in lieu of funds is consistent with the conservation strategy. For example, one of the factors that the Implementing Entity will consider is whether it has sufficient funds available or funding commitments to manage and monitor the conveyed land during the permit term. (See the end of this chapter for a discussion of funding for post-permit management and monitoring.) Funding to ensure management and monitoring of the land conveyed will be provided by the project proponent. Any funds provided by the landowner or Permittee in excess of the amount required to ensure management and monitoring will be credited against any development fees otherwise due. Land cannot be dedicated in lieu of wetland fees and the nitrogen deposition fee.

## Implementing Conservation Actions in Lieu of Development Fees

As described above, at the discretion of the Implementing Entity, landowners and Permittees have the ability to provide land in lieu of all or a portion of select development fees or wetland restoration or creation in lieu of all or a portion of their wetland fees. Permittees with special expertise may also provide other forms of conservation besides land acquisition in lieu of all or a portion of all development fees otherwise owed by them. At the discretion of the Implementing Entity, conservation actions performed or undertaken by Permittees will be eligible to offset development fees if the Permittee satisfies all of the following criteria:

- the conservation action is consistent with the conservation strategy (Chapter 5) or the monitoring and adaptive management program (Chapter 7);
- the conservation action contributes to the biological goals and objectives, the implementation objectives, and would fulfill Plan requirements;
- the conservation action will be completed prior to the date on which development fees are owed; and
- the award of a development fee credit will not hinder the Implementing Entity's ability to satisfy its Stay-Ahead requirement.

For example, a Permittee may conduct portions of the monitoring program that occur in streams under their jurisdiction. In another example, Permittees may provide land management or administrative services to the Implementing Entity, both of which could offset all or a portion of development fees. Conservation actions performed for the Three Creeks HCP to benefit fish covered in that plan may also benefit the covered species in the Habitat Plan and therefore could be credited under both plans.

The monetary value of the credit will be determined by the Implementing Entity on a case-by-case basis. The timing of fee credit will also be determined by the Implementing Entity on a case-by-case basis. In most cases, conservation actions



would need to be performed prior to the covered activity occurring and fee credit being applied (e.g., all aquatic restoration and creation actions would have to occur prior to the construction of the covered activity in order to receive credit toward development fees).

Conservation actions on non-wetland land cover types may be used only to offset land cover fees, not wetland fees. Restoration or creation actions for wetland land cover types can be used only to offset wetland fees, as described below under subheading *Aquatic Restoration or Creation Provided in Lieu of Wetland Fee*.

Permittees that intend to undertake multiple conservation actions may present a package of conservation actions to the Implementing Entity for their approval of credit collectively. Credit provided by conservation actions conducted by a Permittee well in advance of the covered activities may be used by the Permittee to offset fees required for future covered activities.

In quantifying the credit to be awarded for single conservation actions or multiple conservation actions, the Implementing Entity should consider the following:

- the conservation value of the action with respect to Plan implementation requirements, as described based on a standard economic valuation approach related to the Plan fee structure;
- whether the project is located on a site with high resource or restoration values, or has unique or high biological values that support its inclusion in the conservation strategy; and
- whether maintenance and monitoring costs have been identified and are incorporated into cost of the project or otherwise provided according to the requirements of the Plan.

Credits accrued by a Permittee do not have any value beyond covering development fees incurred during Plan implementation. If a Permittee has credits remaining at the conclusion of the permit term, no payment or “refund” will be made to the Permittee. Selling or trading credits between Permittees is not allowed because the funding strategy of the Plan relies on certain contributions of the Permittees beyond their mitigation requirements (see Section 9.4.2 *Local Funding*).

## Fee Exempt Projects and Participating Special Entities

Some private projects exempt from the Habitat Plan fees and Habitat Plan ordinance may wish to pay Plan fees or comply with other Plan conditions to facilitate compliance with environmental laws other than the ESA, CESA, or NCCP Act. For example, urban development on a parcel that is less than 0.5 acre that would not affect streams, riparian, wetlands, ponds, or serpentine would be exempt from the Habitat Plan fees. If this parcel supports a small amount of other natural land cover, the project proponents may wish to pay Habitat Plan fees and apply applicable conditions on covered activities in Chapter 6 through their local development approval process to enhance their project for other

purposes (e.g., CEQA)<sup>27</sup>. Fee payment however, does not define a project applicant's need for incidental take coverage under the Plan. In some cases, projects with minor impacts may not be required to pay Habitat Plan development fees. These project proponents would still be required to submit an application package, as defined in Chapter 6 so that quantifiable impacts can be tracked by the Local jurisdiction and Implementing Entity.

For activities performed by a Participating Special Entity (see Section 8.4 *Participating Special Entities*), the Participating Special Entity will pay, at a minimum, the same fees as the Permittees (i.e., applicable development fees) to receive take authorization. The Implementing Entity may require additional fees to cover direct and indirect costs of extending permit coverage under the Habitat Plan, including the costs of Implementing Entity staff time to assist with permit coverage, a portion of the costs of the initial preparation of the Plan, and a portion of the costs of conservation actions designed to contribute to species recovery.

## 9.4.2 Local Funding

Substantial funds for Plan implementation will come from local sources other than Habitat Plan fees (**Table 9-5**). As described in Chapter 8, land acquisitions and other conservation actions conducted by local organizations can be counted towards the Habitat Plan as long as those conservation actions meet the terms of the Plan. Land acquisition and other conservation actions conducted prior to impacts of the Permittees can be counted towards fee requirements, as described above.

The following local agencies are expected to provide funding that will support the Plan. These local funding sources require that they be used to contribute to the recovery of the covered species (i.e., the NCCP portion of the Plan) or used to mitigate the impacts of their own agency.

Other funding sources may be identified and used during Plan implementation. For example, there may be future ballot measures which could include a funding component for specific elements of Habitat Plan implementation. However, the Local Partners are not expected to, nor are they required to, utilize local general funds for Habitat Plan implementation. Funding shortfalls, and the options available if they occur, are discussed below in Section 9.4.4 *Funding Adequacy*.

## County of Santa Clara Parks and Recreation Department

The County of Santa Clara Parks and Recreation Department has been acquiring lands consistently since its founding in 1956. County Parks has a dedicated source of local funding that is used for land acquisition and a majority of their

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<sup>27</sup> For the funding analysis, no funding was assumed from exempt projects that choose to opt in to the Habitat Plan.

operations and maintenance budget. The Park Charter Fund was approved by voters in 1972 and has been reauthorized six times since, most recently in 2006, by large margins<sup>28</sup>. Currently, the Fund must be reauthorized by the voters every 12 years; the current fund is authorized through 2021. The Fund is generated by an assessment on property throughout Santa Clara County at 1.425 cents per \$100 of assessed value. A minimum of 15% of the Park Charter Fund is earmarked for land acquisition. The County Parks Strategic Plan in 2003 estimated 10-year revenues for land acquisition at over \$67 million (County of Santa Clara 2003). As a source of funding, the Park Charter Fund has restrictions for the use of its funds where funds can only be used for "...the acquisition, development or acquisition and development of real property for county park purposes and for the maintenance and operation of county parks." The intended use of the Park Charter Fund for the goals of the Habitat Plan would need to be consistent with County park purposes for public access and recreation<sup>29</sup>. In addition to the provision of park and recreation purposes, the Park Charter funds can be used to contribute to the recovery of the covered species and/or to mitigate for the impacts of County projects. The funds cannot be used to mitigate private development or the covered activities of non-County Permittees.

County Parks is estimated to acquire 5,950 acres of new land that will directly support the Habitat Plan. Actual acquisitions that support the Plan may exceed this estimation. Any acquisitions conducted by County Parks would be owned by the County. All other species and habitat-related management and monitoring would be paid for by the Implementing Entity. The value of 5,950 acres of land acquisition by County Parks is \$45,980,000 over the life of the Plan (**Table 9-5**). This value was calculated using an average per acre land value of \$7,727, which includes land costs, transaction costs, due diligence, and pre-acquisition surveys (based on total land acquisition costs of \$278,940,000 [**Table 9-1**] and 36,100 total acquired acres for the Reserve System). Of the total amount of approximately 5,950 acres, approximately 1,100 acres are interim conservation lands (**Table 5-5**).

The County Parks Strategic Plan estimated spending on land acquisition at approximately \$5.6 million per year in 2007 dollars (County of Santa Clara 2003), or \$80 million to \$120 million over the 10-year horizon of the Strategic Plan. The \$46.0 million estimate for the Habitat Plan thus represents a conservative portion of the projected expenditures on land acquisition for the agency as a whole over 50 years.

The value of County Parks land contributions to the Habitat Plan could be used to offset any fees that the County would owe to the Habitat Plan for projects undertaken by the County. County Parks' acquisitions would also be used to contribute to the recovery of the covered species; they cannot mitigate the impacts of non-County projects. Wetland fees will not be offset by land acquisition, and in such cases the respective proponents of County projects would have to cover these wetland fees. Development fees that would be owed by the County excluding wetland fees are estimated at \$ 26.7 million (\$23.7 million by

<sup>28</sup> For example, in 1996, the Park Charter Fund was reauthorized by 80.2% of the votes in the affirmative.

<sup>29</sup> See Article VI, Section 604 of the Santa Clara County Code.

County Parks and \$3.0 million by County Roads and Airports), all of which would be offset by the contribution of land to the Plan by County Parks.

## **Land Acquisition by Other Local Land Agencies, Non-Profits, and Foundations**

To complete the Reserve System, an estimated 10,000 acres must be acquired in addition to the land acquisition expected from County Parks, state and federal funding (described below), and land acquisition funded by development fees. The additional 10,000 acres is also needed from local sources to provide adequate local funding matches for the state and federal grants expected for the Plan. The cost of the additional 10,000 acres is estimated at \$77.3 million (**Table 9-5**) based on the same per acre cost used to calculate the estimated value of County Parks land acquisition explained in the prior subsection. The funding for this land acquisition is expected to come from a variety of local land acquisition agencies, non-profit organizations that are dedicated to land acquisition for open space purposes, and local foundations active in this field. Each of these potential sources is described below.

### **Santa Clara County Open Space Authority**

The Open Space Authority currently owns over 15,300 acres of open space in Santa Clara County, approximately 80% in fee title ownership. This agency has been acquiring land since 1995, although most purchases began in 1999.

The Open Space Authority is supported by an assessment district based on property tax assessments in Santa Clara County, San José, Milpitas, Santa Clara, Campbell, and Morgan Hill. The City of Gilroy is not part of the Open Space Authority. To date, the Open Space Authority has spent over \$50 million on land acquisition (not in current year dollars) from their benefit assessment district, grants, and gifts.

The purpose of the Open Space Authority is “to preserve key portions of the natural environment in order to balance continuing urban growth.” This purpose is consistent with the purposes of the Habitat Plan. The boundary of the Open Space Authority coincides almost exactly with that of the Habitat Plan study area. Because of this geographic alignment and a consistent agency purpose with the Habitat Plan, a majority of future acquisition by the Open Space Authority are expected to be suitable for the Habitat Plan Reserve System.

On September 9, 2010, the Open Space Authority Board of Directors adopted a set of principles of participation in the Habitat Plan. These principles will serve as a basis for a more formal agreement between the Open Space Authority and the Implementing Entity. The principles of participation include commitments to help the Implementing Entity implement the Plan by partnering with them on land acquisition and land management. The Open Space Authority Board has also stated their intent to acquire an estimated 5,000 acres for inclusion in the

Reserve System using their own funds and an additional 2,500 acres for the Reserve System if feasible (e.g., leveraging their own funds with those of others).

The Open Space Authority has also stated their intent to enroll an estimated 1,000 acres of their existing lands into the Reserve System that meets the reserve design requirements and principles of the Plan and to enable enhancement actions funded by the Implementing Entity that will benefit the covered species. If Open Space Authority lands could not be enrolled in the Reserve System because conservation easements are precluded<sup>30</sup> and these lands meet all other criteria for Type 1 or Type 2 open space under the Habitat Plan, then the lands could also count towards the 1,000 acres.

In summary, the Open Space Authority intends to incorporate 5,000 acres of interim lands or lands acquired after permits are issued into the Reserve System and may incorporate an additional 2,500; an estimated 7,500 acres of the 10,000 acres (75%) needed from other local funding sources. In addition, the Open Space Authority intends to enroll up to 1,000 acres of existing lands.

The Open Space Authority also acknowledges their likely role as an agent for land management for Reserve System lands on behalf of the Implementing Entity. The Open Space Authority could serve as a land manager on land that it owns within the Reserve System or on land owned by others within the Reserve System.

## **The Nature Conservancy**

As described in Chapter 2, The Nature Conservancy (TNC) is working to preserve land in and adjacent to the study area through its Mount Hamilton Project, which seeks to protect the most ecologically critical 500,000 acres of this landscape. To date, The Nature Conservancy has permanently protected roughly 110,000 acres in the Mount Hamilton Range through acquisition of conservation easements or fee title to ranches east of U.S. 101. Land acquired in fee title has been transferred to land management agencies such as Henry W. Coe State Park, the CDFG, and the Open Space Authority.

Throughout the planning process, TNC has been an active supporter of the Habitat Plan. They have participated in the Stakeholder Group and provided technical support to the conservation strategy. As a result, many of the conservation goals of the Plan are not only consistent with the conservation goals of the Mount Hamilton Project but with TNC's conservation protocols more broadly. TNC is expected to continue to support the Plan in implementation as a potential land acquisition partner to the Implementing Entity. Where conservation goals overlap, TNC may be able to provide matching funds beyond those identified in this chapter to leverage funds provided by the Implementing Entity. In some instances, TNC may be able to act more quickly to secure land

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<sup>30</sup> Interest in land “dedicated for open space purposes” by the Open Space Authority Board cannot be transferred without a vote of the people. This may prohibit conservation easements, which are transfers in land interest.

deals than one of the local public agencies or the Implementing Entity. In these instances, they may act as a land acquisition agent for the Implementing Entity by temporarily holding land until the land can be transferred to a local land management agency like County Parks or the Open Space Authority and added to the Reserve System. In addition, TNC may provide technical assistance to the Implementing Entity during implementation. Although no funding from TNC is identified, TNC would very likely continue to acquire land in the study area, and some of that land is expected to be suitable for the Habitat Plan Reserve System.

## **Peninsula Open Space Trust**

The Peninsula Open Space Trust (POST) is a non-profit land trust that has been actively protecting open space in the Santa Cruz Mountains for over 30 years, including within this Habitat Plan study area. POST is among several strong non-profit conservation leaders in the area covered by the Habitat Plan. Although no funding from POST is identified, POST would likely continue to acquire land in the study area, and some of that land is expected to be suitable for the Habitat Plan Reserve System.

## **Local Foundations**

Local foundations that support open space acquisition and biodiversity planning are expected to play an important role in supporting the Habitat Plan. Foundations such as the Gordon and Betty Moore Foundation (Moore Foundation) and the David and Lucile Packard Foundation (Packard Foundation), which are based in Santa Clara County, have a history of supporting land conservation in the Western United States and are supportive of regional conservation planning in general. The Moore Foundation in particular has expressed support for this Plan acknowledging that the Plan's broad and comprehensive conservation strategy for the region will benefit a wide range of conservation programs and could possibly serve as a model program for others in California. Foundations are expected to continue providing funds beyond those identified in this chapter for land acquisitions within the study area<sup>31</sup>, and this Plan may be considered in their funding decision processes.

## **Interest Income**

A small source of income to the Implementing Entity will come from interest on fund balances generated by development fee revenues held prior to expenditure, with a larger amount coming from earnings on the endowment prior to the end of the permit term. The interest estimate for fee revenues held prior to expenditure assumes that the Plan's fund balances will earn an average interest rate of 3.0%. This is consistent with the assumption generally used by the County of Santa

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<sup>31</sup> As an example, in 2009 and 2010 the Gordon and Betty Moore Foundation provided two grants totaling \$2.38 million to the East Contra Costa County Habitat Conservancy to fund land acquisition for their HCP/NCCP.

Clara Finance Agency when projecting future interest income. Future interest rates are uncertain; however, this assumption is reasonable. The average return rate on the state's Local Agency Investment Fund (LAIF), a statewide investment pool for local agencies, over the 10-year period through fiscal year 2009–2010 was 3.2%, similar to the performance on the County's commingled investment pool.

The Implementing Entity's monetary income from fees is estimated to be approximately \$363.7 million over the 50-year permit period (**Table 9-5**), or an average of \$7.3 million per year. Local government finance experts indicate that local agencies often hold operating reserve balances equal to approximately 20% of their annual revenue. Thus, it is estimated that the Implementing Entity's average fund balances from fees will be 20% of its annual fee income. (The Plan assumes no interest generated from grant funds due to the typical requirement to spend the land acquisition grants immediately.) Using this assumption, interest income from the Plan's non-grant revenue is estimated to be \$2.2 million over the 50-year permit period (**Table 9-5**).

### 9.4.3 State and Federal Funding

The U.S. Congress and the California Legislature have determined that conserving species and their natural habitats is an issue of both national and state importance. The federal and state governments will strive to assist local governments and property owners to assemble, manage, and monitor the Habitat Plan Reserve System. This assistance will contribute to the land acquisition requirements of the Plan, contribute to recovery of listed species in the study area, and reduce or avoid the need to list additional species as threatened or endangered.

Through this Habitat Plan and the Implementing Agreement with the Permittees, the federal and state governments will endeavor to contribute 14,900 acres of land to the Reserve System that will be administered, managed, and monitored by the Implementing Entity<sup>32</sup>. To be conservative, the Plan assumes that the Implementing Entity will incur the costs of administering, managing, and monitoring these lands. Funding for this land acquisition could come from a variety of sources, including those administered by CDFG and USFWS (**Table 9-13**). Land contributions by USFWS and CDFG could be provided through contributions by the Wildlife Conservation Board. An assessment of progress toward this goal will be made annually and included in the annual report of the Implementing Entity submitted to CDFG and USFWS.

State and federal funding sources other than those administered by CDFG and USFWS (and other than the Wildlife Conservation Board) are also expected to

<sup>32</sup> 14,900 acres = \$115 million / \$7,727 per acre average land acquisition cost, rounded to the nearest hundred acres. Although this acreage contribution represents 41% of the new land acquired for the Reserve System, this overstates the percentage of the overall effort attributable to State and Federal contribution to the Plan from these funding sources because of Plan costs in addition to land acquisition, e.g., management and monitoring costs.

play an important role in implementing the Habitat Plan. For example, many of the funding sources described in **Table 9-13**, especially sources administered by the California Coastal Conservancy and the California Department of Parks and Recreation, have provided substantial revenues in the past for habitat conservation in the Habitat Plan study area.

If, after the exercise of all available authority and utilization of all available resources, the CDFG and USFWS are unable to contribute 14,900 acres to the Habitat Plan Reserve System, the Implementing Entity, the Permittees, CDFG, and USFWS will reevaluate the Plan and work together to develop a mutually acceptable solution.

Implementation of the Habitat Plan is subject to the federal Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Plan will require the obligation, appropriation, or expenditure of any money from the United States Treasury. USFWS will not be required to expend any federal agency's appropriated funds until an authorized official of that agency commits these funds in writing. Similarly, CDFG will not be required to expend any state agency's appropriated funds until an authorized official of that agency commits these funds in writing. The state and federal agencies will use their best effort to contribute the acreage identified above.

## Measuring State and Federal Contributions

State and federal contributions to the Plan are earmarked only for the portion of the Plan that contributes to the recovery of covered species. State and federal contributions cannot be used for the mitigation component of the Plan.

Estimated contributions by the state or federal government must be measured in terms of acreage rather than dollars. To address this, Plan funding source assumptions from **Table 9-5** were converted to acreage based on the overall average cost per acre of reserve land. This calculation assumes that the state and federal agencies will not be acquiring and managing the land themselves (e.g., in a new State Ecological Reserve or National Wildlife Refuge).

The contribution of state and federal funds, which is tracked by acres of land acquired, assumes that the Implementing Entity will administer, manage, and monitor the land itself and pay all of those costs. If the state or federal agency acquires and manages the land, the contribution in acres from the state or federal agency will be adjusted to account for this additional financial contribution. If all costs to restore, enhance, manage, and monitor the land are assumed by the state or federal agency, the \$115 million contribution would be the equivalent of 6,424 fully-managed acres<sup>33</sup>. If the state or federal agency assumes some but not all responsibility for management and monitoring then the land acquisition

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<sup>33</sup> \$115 million / \$611 million \* 34,153 acres = 6,424 acres. The denominator = \$657 million total cost including endowment fund balance at end of permit term, minus the \$3 million of plan preparation costs and the \$43 million to manage County Parks lands incorporated into the Reserve System.



contribution will be accounted for by mutual agreement between the Wildlife Agencies and the Implementing Entity. As with other partners, all land acquired by state or federal agencies must be managed in accordance with the standards of the Habitat Plan.

If the state and/or federal governments contribute a portion of the costs of a land acquisition, the state and/or federal contribution will be measured as a share of the overall acquired acreage that is in proportion to the state and federal share of the overall costs of the acquisition.

## State and Federal Funding Sources

### Federal Endangered Species Act Section 6 Program

USFWS's Cooperative Endangered Species Conservation Fund authorized under Section 6 of the ESA<sup>34</sup> is likely to provide a significant source of grant funding for the Habitat Plan. USFWS annually provides significant funds to local jurisdictions developing regional HCPs. The Section 6 grant program is divided into three funding categories: HCP Assistance (for planning), HCP Land Acquisition, and Recovery Land Acquisition Grants. Grants are applied for and administered by CDFG. The Habitat Plan has already received four grants from the HCP Assistance program totaling \$1.3 million. During implementation, the Plan will be eligible for HCP Land Acquisition grants.

Since 2002, USFWS has made available, on average, \$52.5 million in land acquisition funds nationally. Of this, an average of approximately 44%—nearly \$23 million—was dedicated annually for land acquisition for HCPs in California<sup>35</sup>. Since 2002, California has received over \$160 million in land acquisition funding for approved HCPs and NCCPs, by far the largest share of any state.

### State Funding Sources

As described in **Table 9-13**, there are a variety of sources available for state funding, including existing California propositions (e.g., Proposition 84). Proposition funding for the Habitat Plan can come from a variety of sources including the Wildlife Conservation Board, CalFed Bay-Delta Program, and California Department of Parks and Recreation. More state bond measures for open space preservation and management are expected to be issued as California propositions during the 50-year term of the Plan. For example, Proposition 84 was passed by California voters in the November 2006 General Election by a margin of 53.7%. This bond provides funding for water, park, and natural projects, including \$90 million for certain NCCPs, and \$108 million for the San

<sup>34</sup> The Fund is commonly referred to as the “Section 6” grant program.

<sup>35</sup> Funding levels to California have held steady for at least eight years. Annual funding to California reached a peak in FY 2007, when 67% of all HCP land acquisition funding went to the state.

Francisco Bay Conservancy Program. Additional bonds similar to Proposition 84 and with approved NCCPs, including the Santa Clara Valley Habitat Plan, are expected to be put forward to the voters several times during the 50-year permit term.

## Mitigation and Conservation Components

As discussed in Chapter 1, NCCPs are required to conserve species and their habitats. To achieve this standard, this conservation strategy exceeds typical project mitigation requirements. Although the Plan provides a single conservation strategy to mitigate impacts and conserve covered species, it is important to roughly delineate the mitigation obligations of the Plan from the conservation components because USFWS and CDFG can only fund land acquisition that contributes to the conservation component of the Plan (i.e., they cannot subsidize mitigation).

As described above, development fees were determined, in part, on the basis of mitigation requirements without the Habitat Plan. Preservation ratios were estimated for all terrestrial land cover types based on previously accepted mitigation ratios proposed on a project-by-project basis to offset impacts to occupied habitat for the covered species. Based on these ratios, the overall mitigation component of the Plan is estimated at approximately 56% of the land acquisition (i.e., 56% of the 36,100 acres of new land acquired = 20,216 acres that are administered, managed, and monitored).

This analysis is provided only for convenience to help delineate eligibility for state and federal grant funding for the conservation portion of the Plan. The calculation above cannot be applied as a project mitigation ratio because it was calculated based on the substantial economies of scale available in this Plan (e.g., preserving large blocks of land that support many covered species).

The Habitat Plan is a single plan that must be implemented as a whole. Permits will be issued on the basis of implementation of the entire Plan. The development fees will cover the responsibilities and requirements of the Implementing Entity and participating local jurisdictions to both mitigate their impacts and conserve in the study area. State and federal contributions; continuing local, state, and federal conservation efforts; and funding from private competitive grants can contribute to the conservation component of the Plan.

### 9.4.4 Funding Adequacy

As shown in **Table 9-5**, funding sources will meet all expected costs of the Habitat Plan. The funding sources described in this chapter have been estimated conservatively. That is, actual funding from local, state, and federal sources may exceed these projections. For example, County Parks may acquire more land than is predicted that would contribute to the Reserve System. Alternatively, additional revenue may be secured from fees on Participating Special Entities.

Temporary impact fees may also exceed projections if many applicants choose to pay all applicable development fees in full rather than try to estimate the frequency of their activities during the permit. Despite these conservative assumptions and additional revenue sources, revenue may fall short of costs. This section further discusses the adequacy of Plan funding.

## **Additional Funds Needed for Management or Monitoring**

The contingency fund is primarily intended to offset land management or monitoring costs that are higher than predicted by this Plan on a short-term basis. If this fund is inadequate to offset these costs, or if costs are predicted to exceed revenue on a long-term basis, then the Implementing Entity will consider whether to adjust management and monitoring requirements without jeopardizing meeting Habitat Plan requirements, or to raise revenue to offset the funding shortfall. When feasible, the Implementing Entity will make reasonable adjustments to revenue to meet the obligations of the Habitat Plan. Some changes may require a minor or major amendment to the Habitat Plan. See Chapter 10 for rules regarding changes to the Habitat Plan.

## **Actions Required Should Land Acquisitions not Keep Pace with Impacts**

The NCCP Act requires that conservation keep pace with development in “rough proportionality.” The Stay-Ahead provision of the Plan (see Chapter 8) is intended to ensure that land acquisition and enhancement, restoration, and creation stay within 10% deviation of impacts<sup>36</sup>. Meeting this requirement, however, depends on the steady acquisition of land from willing sellers.

The nature of land acquisition is such that assembly of the Reserve System is not likely to be accomplished in a constant or predictable fashion. It is expected that large (500 acres or more) land acquisitions will comprise the bulk of the total acreage of the Reserve System. Acquisition of large parcels (or combinations of parcels) is typically more complex and may take longer to realize than acquisition of small parcels. Therefore, additions to the Reserve System are expected to be episodic. As a result, the Implementing Entity may be behind in land acquisition relative to impacts for short periods of time while large land acquisition deals are being processed. Over the long term, larger land acquisitions will save money because of their typically lower price per acre and lower per acre land transactions costs.

The Implementing Entity will be responsible for performing the conservation actions necessary to comply with the Stay-Ahead provision, as described in

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<sup>36</sup> The 10% deviation allowance does not apply to covered plants. Plant conservation measures will always precede impacts, with the exception of the Coyote ceanothus (Section 5.4.11).

Chapter 8. If the Implementing Entity determines it is at risk of non-compliance with the Stay-Ahead provision for land acquisition (e.g., greater than 10% deviation from the requirements without reasonable land acquisitions in the pipeline), the Implementing Entity may notify the other Permittees that it is necessary to temporarily require project proponents to provide land instead of paying a fee, unless the Permittee has previously accrued sufficient credits to offset any fee otherwise due. If the Stay-Ahead provision is not satisfied for land acquisition for any land cover type based on the criteria in Section 8.6.1 *Stay-Ahead Provision* of Chapter 8, the Implementing Entity must notify the other Permittees that it is necessary to temporarily require project proponents to provide land instead of paying a fee unless the Wildlife Agencies agree, after conferring with the Implementing Entity, that a different plan of action devised with the Implementing Entity will remedy the situation and it is not necessary to require project proponents to provide land instead of paying a fee. If the Implementing Entity determines that it is at risk of non-compliance with the Stay-Ahead provision for other components of the conservation strategy besides land acquisition (e.g., habitat restoration), the Implementing Entity will confer with the Wildlife Agencies immediately to determine the best course of action.

If the Implementing Entity initiated the requirement due to its own determination that the Plan was at risk of non-compliance, the requirement to provide land instead of a fee will be lifted (i.e., it will revert back to an option) as soon as the Implementing Entity determines that it is no longer at risk of non-compliance with the Stay-Ahead provision. If the requirement is imposed by the Wildlife Agencies as a result of non-compliance with the Stay-Ahead provision, the requirement will be lifted as soon as the Implementing Entity demonstrates in writing to the reasonable satisfaction of the Wildlife Agencies that the Plan is in compliance with the Stay-Ahead provision.

## **Actions Required Should Development Fee Funding Fall Short of Expectations**

This chapter describes the funding expected from development fees from the implementation of covered activities by public agencies (the Permittees) and private developers. These estimates are based on long-term projections of development based on historic patterns and the approval planning documents of local jurisdictions. The pace of development has slowed considerably in the study area as a result of the 2008–2009 economic recession. As a result, the pace of development is not expected to reach pre-2008 levels for many years. Revenue from covered activities during the first 5 to 10 years of implementation may fall short of expectations.

Revenue from non-fee funding sources could offset the shortfall in fee funding in the short term, providing enough funding for land acquisition early in the Plan. However, most non-fee funding cannot be used for land management, monitoring, or administrative costs associated with the Reserve System. These costs are dependent on fee funding. In the short term, if fee funding cannot keep pace with the operations and management needs of the Reserve System, the

Implementing Entity will consider the following options in consultation with the Wildlife Agencies:

- Continued acquisition of land from willing sellers for the Reserve System to take advantage of lower land costs but deferral of non-essential management and monitoring of these lands for up to 5 years or when development fee revenue is sufficient, whichever comes first (see below for additional details on this option).
- Identifying new funding sources that will cover the costs of operations and maintenance of the Reserve System until fee revenue increases to offset these costs over the long term.
- With the approval of the Wildlife Agencies, defer implementation tasks that are not critical for compliance with the permits, IA, and Habitat Plan, some of which are included in **Table 8-1**.
- Other options that meet the biological goals and objectives of the Plan and are consistent with the permits, IA, and Plan.

As described in Chapter 5, if development fee funding falls short of expectations but the Reserve System is expanding as fast or faster than it should to meet the Stay Ahead requirement, the Implementing Entity may defer management of these lands until development fee funding (or other sources) are available. Specifically, if needed the Implementing Entity may limit management to essential management tasks and defer non-essential management tasks for up to 5 years from the purchase of the first parcel of each reserve unit, or when development fees become available, whichever comes first. Essential management tasks are defined as those tasks necessary to ensure that the condition of the reserve unit does not degrade below the existing condition at the time it was incorporated into the Reserve System in terms of natural land cover and covered species habitat. Existing conditions will be documented by the Implementing Entity through the pre-acquisition assessment and the site inventory, described in Chapters 7 and 8. Management in response to changed circumstances (i.e., remedial actions described in Chapter 10) cannot be deferred.

Over the entire permit term, fee revenue may also fall short of expectations if fewer covered activities occur than assumed under the Plan. Although unlikely, this shortfall will make it difficult for the Permittees to meet their conservation obligations. If it appears that take authorized under the permits will fall short of expectations, substantially reducing fee revenue, the Implementing Entity and other Permittees will work with the Wildlife Agencies to extend the term of the permits to allow the use of the authorized take and allow full implementation of the Plan. As described above, the Local Partners are not expected to, nor are they required to, utilize local general funds for Habitat Plan implementation in the event of funding shortfalls as a result of less fee revenue than expected, either in the short term or the long term.

Alternatively, if revenues fall far short of expectations and it is unlikely that the Permittees will meet their permit obligations they may apply to reduce the authorized take and reduce the permit obligations. Any permit term extension or

request for reductions in Plan obligations will follow the requirements for a major amendment described in Chapter 10.

## **Actions Required Should Non-Fee Funding Fall Short of Expectations**

This chapter describes the non-fee funding sources that are being committed or are expected to be provided by local, state, and federal agencies (see Sections 9.4.2 *Local Funding* and 9.4.3 *State and Federal Funding*). These commitments and expectations are based on conservative assumptions and a track record of providing similar funding locally or to other HCPs and NCCPs in northern California. Despite these assumptions, it is possible that these non-fee funding sources will fall short of expectations. These local sources are intended to contribute to conservation actions (i.e., not mitigation). If these funding sources fall short, then the Implementing Entity may have difficulty meeting its obligation to provide for the conservation of some of the covered species.

In the event of shortfalls in non-fee funding, the Implementing Entity will make reasonable adjustments to expenditures to meet the obligations of the Habitat Plan. If these adjustments are inadequate to address the shortfall, the Implementing Entity will consult with the Wildlife Agencies regarding the best course of action. As described above, the Local Partners are not expected to, nor are they required to, utilize local general funds for Habitat Plan implementation in the event of funding shortfalls as a result of less non-fee revenue than expected. Actions considered will include reducing take authorization and conservation obligations in proportion to the funding shortfall. Such reductions would need to follow the major amendment process described in Chapter 10.

## **Funding for Post-Permit Management and Monitoring**

After the permit term, all of the Permittees are obligated to continue to protect, manage, and maintain the Reserve System<sup>37</sup>. This includes adaptive management and monitoring at a level sufficient to determine whether management is effective. Other obligations, however, disappear after the permit term. For example, the Permittees are no longer obligated to annually report the status of the Plan to the Wildlife Agencies. Three to 5 years prior to the termination of the permit, the Permittees will determine how to handle the continuing obligations of the Implementing Entity with the approval of the Wildlife Agencies. Preservation, enhancement, restoration, and creation obligations will also be completed prior to the end of the permit term and will not continue post-permit. Remedial measures and contingency also no longer need to be funded after the permit term.

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<sup>37</sup> The Implementing Entity may or may not exist after the permit term. Regardless, all Permittees have the obligation to maintain the Reserve System after the permit term.

Detailed assumptions regarding post-permit costs are presented in **Appendix G**. Annual costs to operate and maintain the Reserve System in perpetuity are estimated to be approximately 64% of the annual cost for program administration estimated during Years 46–50, 80% of reserve management and maintenance costs, and 34% of monitoring costs (**Table 9-4**). Total post-permit costs are estimated to be approximately \$2.9 million annually. Actual long-term costs may be lower if the Implementing Entity can develop streamlined procedures for management and monitoring during the permit term or reduce administrative costs. Responsibility for funding long-term management and monitoring rests solely with the Permittees.

Funding provided by interest on the endowment is expected to fully fund post-permit costs. Any shortfalls in the endowment during the permit term will be identified by the 5-year funding assessments conducted by the Implementing Entity. If the endowment is not growing fast enough to reach its target size, then the endowment fee portion of the development fees will be increased to make up the shortfall. With these built-in safeguards in the endowment, post-permit funding is expected to be adequate to fully offset post-permit costs of management and monitoring.





Table 9-1. Summary of Habitat Plan Implementation Cost Estimate

Final Plan

2010 dollars

Total Budget (rounded to the nearest ten thousand)

	Total Cost per Implementation Period (Years)											Total	Annual Average
Budget Category	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition	\$3,730,000	\$27,380,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$30,690,000	\$0	\$278,940,000	\$5,580,000
Reserve Management and Maintenance	\$0	\$3,750,000	\$8,580,000	\$8,920,000	\$10,140,000	\$9,940,000	\$10,920,000	\$10,720,000	\$10,660,000	\$10,990,000	\$10,740,000	\$95,360,000	\$1,910,000
Monitoring, Research, and Scientific Review	\$0	\$2,140,000	\$2,180,000	\$2,600,000	\$2,410,000	\$2,810,000	\$2,960,000	\$3,350,000	\$3,600,000	\$4,040,000	\$4,140,000	\$30,230,000	\$600,000
Western Burrowing Owl Conservation Strategy	\$0	\$320,000	\$700,000	\$580,000	\$810,000	\$770,000	\$1,020,000	\$920,000	\$1,210,000	\$1,100,000	\$1,140,000	\$8,570,000	\$170,000
Habitat Restoration/Creation	\$0	\$10,420,000	\$10,750,000	\$11,000,000	\$11,230,000	\$11,330,000	\$11,390,000	\$11,490,000	\$11,340,000	\$1,850,000	\$1,830,000	\$92,630,000	\$1,850,000
Program Administration	\$330,000	\$3,740,000	\$3,980,000	\$4,220,000	\$4,350,000	\$4,590,000	\$4,650,000	\$4,800,000	\$4,970,000	\$5,170,000	\$5,090,000	\$45,890,000	\$920,000
Contingency Fund	\$110,000	\$1,010,000	\$1,280,000	\$1,300,000	\$1,330,000	\$1,340,000	\$1,380,000	\$1,380,000	\$1,400,000	\$1,410,000	\$480,000	\$12,420,000	\$250,000
Total	\$4,170,000	\$48,760,000	\$58,490,000	\$59,640,000	\$61,290,000	\$61,800,000	\$63,340,000	\$63,680,000	\$64,200,000	\$55,250,000	\$23,420,000	\$564,040,000	\$11,280,000

Capital Budget (rounded to the nearest ten thousand)

	Total Cost per Implementation Period (Years)											Total	Annual Average
Budget Category	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: acquisition and site improvements	\$3,600,000	\$26,320,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,560,000	\$0	\$268,640,000	\$5,370,000
Reserve Management and Maintenance: vehicles, equipment, and facilities	\$0	\$1,510,000	\$1,520,000	\$1,630,000	\$2,310,000	\$1,840,000	\$2,490,000	\$2,020,000	\$2,060,000	\$2,150,000	\$1,900,000	\$19,430,000	\$390,000
Monitoring & Research: equipment and vehicles	\$0	\$10,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$140,000	\$3,000
Western Burrowing Owl Conservation Strategy	\$0	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$100,000	\$2,000
Habitat Restoration/Creation: construction, office equipment, and vehicles	\$0	\$9,400,000	\$9,400,000	\$9,420,000	\$9,410,000	\$9,430,000	\$9,410,000	\$9,430,000	\$9,420,000	\$50,000	\$30,000	\$75,400,000	\$1,510,000
Program Administration: equipment purchases	\$20,000	\$80,000	\$50,000	\$70,000	\$50,000	\$90,000	\$50,000	\$70,000	\$50,000	\$90,000	\$50,000	\$670,000	\$10,000
Contingency, land acquisition and site improvements	\$110,000	\$790,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$890,000	\$0	\$8,090,000	\$160,000
Total	\$3,730,000	\$38,120,000	\$41,770,000	\$41,930,000	\$42,570,000	\$42,170,000	\$42,750,000	\$42,330,000	\$42,330,000	\$32,770,000	\$2,000,000	\$372,470,000	\$7,445,000
Land acquisition cost per acre acquired												\$7,400	
Restoration cost per acre restored (not including stream restoration)												\$81,000	

Operational Budget (rounded to the nearest ten thousand)

	Total Cost per Implementation Period (Years)											Total	Annual Average
Budget Category	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: transaction costs	\$130,000	\$1,070,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$0	\$10,320,000	\$210,000
Reserve Management and Maintenance: facility, vehicle, and equipment maintenance and personnel	\$0	\$2,240,000	\$7,060,000	\$7,290,000	\$7,830,000	\$8,100,000	\$8,440,000	\$8,700,000	\$8,610,000	\$8,840,000	\$8,840,000	\$75,950,000	\$1,520,000
Monitoring, Research, and Scientific Review	\$0	\$2,130,000	\$2,170,000	\$2,580,000	\$2,400,000	\$2,790,000	\$2,950,000	\$3,330,000	\$3,600,000	\$4,020,000	\$4,140,000	\$30,110,000	\$600,000
Western Burrowing Owl Conservation Strategy	\$0	\$300,000	\$690,000	\$580,000	\$790,000	\$760,000	\$1,010,000	\$910,000	\$1,200,000	\$1,100,000	\$1,130,000	\$8,470,000	\$170,000
Habitat Restoration/Creation: vehicle maintenance and personnel, long-term management/monitoring	\$0	\$1,020,000	\$1,350,000	\$1,580,000	\$1,820,000	\$1,900,000	\$1,980,000	\$2,060,000	\$1,930,000	\$1,800,000	\$1,800,000	\$17,240,000	\$340,000
Program Administration: personnel, legal and financial assistance, insurance, ED's discretionary budget, in-lieu funding	\$310,000	\$3,660,000	\$3,930,000	\$4,150,000	\$4,300,000	\$4,490,000	\$4,600,000	\$4,730,000	\$4,920,000	\$5,080,000	\$5,040,000	\$45,210,000	\$900,000
Operating Contingency Fund	\$0	\$220,000	\$380,000	\$400,000	\$440,000	\$440,000	\$480,000	\$490,000	\$500,000	\$520,000	\$480,000	\$4,350,000	\$90,000
Total	\$440,000	\$10,640,000	\$16,720,000	\$17,720,000	\$18,720,000	\$19,620,000	\$20,600,000	\$21,360,000	\$21,900,000	\$22,500,000	\$21,430,000	\$191,650,000	\$3,830,000
Average Annual Cost per Acre Managed, New Reserve System		\$553	\$329	\$237	\$191	\$162	\$144	\$129	\$116	\$107	\$101		
Average Annual Cost per Acre Managed, Existing Open Space		\$2	\$71	\$71	\$71	\$71	\$71	\$71	\$71	\$71	\$72		

Notes:  
Detail may not add to total due to rounding at various stages of the calculations.

**Table 9-2. Santa Clara Valley Habitat Plan Reserve System Summary**

	Acres
Permanent Impact <sup>1</sup>	17,975
<b>New Acquisition for the Reserve System</b>	
Mitigation <sup>2</sup>	20,112
Enhancement	15,988
<i>Subtotal</i> <sup>3</sup>	<i>36,100</i>
<b>Existing Open Space Contributed to the Reserve System<sup>4</sup></b>	
County of Santa Clara Parks and Recreation Department	12,291
Santa Clara County Open Space Authority	1,000
<i>Subtotal</i>	<i>13,291</i>
<b>Total Estimated Minimum Size of the Reserve System<sup>5</sup></b>	<b>49,391</b>

<sup>1</sup> See **Table 4-2**.

<sup>2</sup> See *Development Fee Nexus Study* for calculation of mitigation requirement for Reserve System.

<sup>3</sup> Includes 1,100 acres of interim conservation lands (acquisition between signing of the 2007 Planning Agreement and issuance of Plan permits) by County Parks (see **Table 5-5**). To the extent that these are non-wetland land covers this land could be mitigation in lieu of the County's development fee obligation for County covered activities (not private development). Otherwise these lands would apply to the enhancement component of the Reserve System.

<sup>4</sup> See **Table 5-5**.

<sup>5</sup> The total size of the Reserve System will be at least 46,496 acres and up to an estimated 46,920 acres. The acreage 49,391 is a sum of acres of assumed acquired lands plus existing open space. The assumption for acquired acres is based on a hypothetical Reserve System design that meets all of the minimum acquisition requirements as described in **Table 5-13**.

**Table 9-3.** Summary of Annual Management and Monitoring Costs per Acre

2010 dollars

**Total Budget (rounded to the nearest ten thousand)**

[illegible]

**Table 9-4.** Summary of Habitat Plan Budget After Permit Term

	Avg. Annual Cost After Permit Term <sup>1</sup>		Post-Permit Budget as a Percent of Year 46-50
	All Reserve Lands	Restored Wetlands	Annual Costs
<b>Total Budget</b>			
Land Acquisition	\$0	\$0	--
Reserve Management and Maintenance	\$1,710,000	\$36,000	81%
Monitoring, Research, and Scientific Review	\$280,000	\$27,000	37%
Western Burrowing Owl Conservation Strategy	\$230,000	\$0	100%
Habitat Restoration/Creation	\$0	\$0	0%
Program Administration	\$650,000	\$0	64%
Contingency Fund	\$0	\$0	0%
<b>Total</b>	<b>\$2,870,000</b>	<b>\$63,000</b>	<b>63%</b>
<b>Capital Budget</b>			
Land Acquisition: acquisition and site improvements	\$0	\$0	--
Reserve Management and Maintenance: vehicles, equipment, and facilities	\$120,000	\$0	32%
Monitoring & Research: equipment and vehicles	\$600	\$0	30%
Western Burrowing Owl Conservation Strategy	\$2,000	\$0	100%
Habitat Restoration/Creation: construction, office equipment, and vehicles	\$0	\$0	0%
Program Administration: equipment purchases	\$10,000	\$0	100%
Contingency, land acquisition and site improvements	\$0	\$0	0%
<b>Total</b>	<b>\$132,600</b>	<b>\$0</b>	<b>33%</b>
<b>Operational Budget</b>			
Land Acquisition: transaction costs	\$0	\$0	--
Reserve Management and Maintenance: facility, vehicle, and equipment maintenance and personnel	\$1,590,000	\$36,000	92%
Monitoring, Research, and Scientific Review	\$280,000	\$27,000	37%
Western Burrowing Owl Conservation Strategy	\$230,000	\$0	100%
Habitat Restoration/Creation: vehicle maintenance and personnel	\$0	\$0	0%
Program Administration: personnel, legal and financial assistance, insurance, ED's discretionary budget, in-lieu funding	\$640,000	\$0	63%
Operating Contingency Fund	\$0	\$0	0%
<b>Total</b>	<b>\$2,740,000</b>	<b>\$63,000</b>	<b>65%</b>
Land Acquired and Managed for Reserve System <sup>2</sup>	34,153		
Existing Open Space Managed for Reserve System	13,291		
Total Acres Managed / Wetlands Restored	<b>47,444</b>	<b>506</b>	
Average Annual Cost per Acre Managed, New Reserve System	\$50	\$120	
Average Annual Cost per Acre Managed, Existing Open Space	\$70		

Notes:

Detail may not add to total due to rounding at various stages of the calculations.

<sup>1</sup> For details on the assumptions for these calculations, see the Cost Model in Appendix G, sheets "9-4 SummaryPostPermitBudget" and "G-9 Assumptions\_PostPermit."

<sup>2</sup> Includes the total acres of preserved and restored or created land cover types that will be managed in perpetuity.

**Table 9-5. Funding Sources**

Funding Source	Final Plan Amount	% of Funding	Source
<b>Development Fees</b>			
Land Cover and Nitrogen Deposition Fees			
Private Development (all jurisdictions)	\$ 163,440,000	25%	Local
County of Santa Clara <sup>1</sup>	\$ -	0%	Local
City of San Jose	\$ 2,000,000	0%	Local
City of Gilroy	\$ 80,000	0%	Local
City of Morgan Hill	\$ 290,000	0%	Local
Santa Clara Valley Water District	\$ 8,090,000	1%	Local
Santa Clara Valley Transportation Agency	\$ 1,560,000	0%	Local
Serpentine Fee <sup>1</sup>	\$ 29,270,000	4%	Local
Wetland Fee (private development and public agencies)	\$ 77,600,000	12%	Local
Burrowing Owl Fee	\$ 8,830,000	1%	Local
Temporary Impact Fees (all public agencies)	\$ 16,010,000	2%	Local
Endowment Fee Component	\$ 36,500,000	6%	Local
Plan Preparation Fee Component <sup>2</sup>	\$ 3,010,000	0%	Local
Participating Special Entity Fees	\$ 17,000,000	3%	Local
<b>Total Fee Funding</b>	<b>\$ 363,680,000</b>	<b>55%</b>	
<b>Non-Fee Funding</b>			
<b>Other Local Funding</b>			
County of Santa Clara Parks and Recreation Land Acquisition <sup>1,3</sup>	\$ 45,980,000	7%	Mixed <sup>7</sup>
Land Acquisition by Local Land Agencies, Non-Profits, and Foundations <sup>3,4</sup>	\$ 77,270,000	12%	Mixed <sup>7</sup>
Interest Income on Permit Period Funding <sup>5</sup>	\$ 2,180,000	0%	Local
Endowment Investment Income <sup>6</sup>	\$ 53,640,000	8%	Local
Total Other Local Funds	\$ 179,070,000	27%	
<b>State and Federal Funding</b>			
New Wildlife Agency Funds (Section 6, etc.)	\$ 115,000,000	17%	Mixed
<b>Total Non-Fee Funding</b>	<b>\$ 294,070,000</b>	<b>45%</b>	
<b>Total Funding and Plan Costs</b>			
Total Funding	\$ 657,750,000	100%	
Plan Implementation Budget (excl. Plan Preparation and Endowment)	\$ 564,040,000		
Plan Preparation Costs	\$ 3,010,000		
Endowment Balance at End of Permit Period	\$ 90,140,000		
Total Cost of Plan and Endowment	\$ 657,190,000		
Surplus / (Deficit)	\$ 560,000		

<sup>1</sup> Development fees except for permanent and temporary wetland mitigation fees for County of Santa Clara covered activities (County Parks and County Roads and Airports) are excluded because fees would be more than offset by County Parks acquisition of land for Reserve System (estimated at 5,950 acres).

<sup>2</sup> Net plan preparation costs were reduced by 20% to exclude estimated costs associated with recovery and limit costs for the purposes of the development fee to mitigation-related planning only.

<sup>3</sup> Acquisition costs based on average per acre costs for Plan including transaction costs.

<sup>4</sup> Cost of land to be provided agencies and organizations that acquire and preserve land in Santa Clara County (estimated at 10,000 acres) such as the Santa Clara County Open Space Authority, the Peninsula Open Space Trust, The Nature Conservancy, The Silicon Valley Land Conservancy, David and Lucille Packard Foundation, the Gordon and Betty Moore Foundation, and others.

<sup>5</sup> Estimated interest earned on permit term operating fund balances generated by development fees. Based on 3% annual interest (recommended by County of Santa Clara Finance Department) applied to a fund balance estimated to equal 20% of average annual total development fee revenue.

<sup>6</sup> Based on an assumed real interest rate of 3.25% over inflation applied to endowment fee revenue, consistent with projected returns on long-term endowment investment funds held for the California Department of Fish and Game by the National Fish and Wildlife Foundation.

<sup>7</sup> Funding sources may be a mix of local sources, state grants, and federal grants from agencies such as the California Coastal Conservancy and State Wildlife Conservation Board.

**Table 9-6. Land Cover Development Fees**

Development Fee Type <sup>1,2</sup>	Unit	Projected Initial Fee Amount <sup>3</sup>	Alternative Payment Mechanisms <sup>4</sup>
<b>Land Cover Fee</b>			
Zone A: Mostly natural lands	per acre	\$ 15,416	Land in lieu; mitigation bank credit
Zone B: Mostly agricultural and valley floor rural residential lands	per acre	\$ 10,688	Land in lieu; mitigation bank credit
Zone C: Small vacant sites between 0.5 and 10 acres surrounded by urban development	per acre	\$ 3,905	Land in lieu; mitigation bank credit
<b>Serpentine Fee</b>	per acre	\$ 50,166	Land in lieu (must be serpentine)
<b>Nitrogen Deposition Fee</b>	per new vehicle trip	\$ 3.60	Other mechanism determined during implementation
<b>Burrowing Owl Fee</b>	per acre	\$ 50,438	Land in lieu (must be occupied nesting habitat)
<b>Wetland Fee</b>			
Willow Riparian Forest and Mixed Riparian	per acre	\$ 139,708	Wetland mitigation in lieu; mitigation bank credit
Central California Sycamore Woodland	per acre	\$ 255,182	Wetland mitigation in lieu; mitigation bank credit
Freshwater Marsh	per acre	\$ 171,322	Wetland mitigation in lieu; mitigation bank credit
Seasonal Wetlands	per acre	\$ 374,842	Wetland mitigation in lieu; mitigation bank credit
Pond	per acre	\$ 153,321	Wetland mitigation in lieu; mitigation bank credit
Stream	per linear ft.	\$ 588	Wetland mitigation in lieu; mitigation bank credit
<b>Temporary Impact Fee</b>			
Land Cover	per acre	Varies <sup>5</sup>	Land in lieu; mitigation bank credit
Serpentine	per acre	Varies <sup>5</sup>	Land in lieu (must be serpentine)
Burrowing Owl	per acre	Varies <sup>5</sup>	Land in lieu (must be occupied nesting habitat)
Wetland	per acre	Varies <sup>5</sup>	Wetland mitigation in lieu; mitigation bank credit

<sup>1</sup> See Chapter 9 for details of each development fee and in what circumstances it is required.

<sup>2</sup> The Endowment fee and Plan Preparation fee are included in the appropriate Habitat Plan fees listed in this table as described in Chapter 9.

<sup>3</sup> Projected initial fees would apply only in the first year of Plan implementation. All development fees would be adjusted (up or down) on an annual basis by a date determined by the Implementing Entity's Governing Board within the first 6 months of Plan implementation.

<sup>4</sup> All fees may be paid in cash or, at the discretion of the Implementing Entity, through implementation of conservation actions.

<sup>5</sup> Temporary fee varies based on duration of impact. See Chapter 9 text for details.

**Table 9-7a.** Habitat Plan Land Cover Development Fees and Estimated Revenue

Item	Fee Zone <sup>1</sup>			Serpentine Fee <sup>2</sup>	Total
	Zone A: Mostly Natural Lands	Zone B: Mostly Agricultural and Rural Residential Lands	Zone C: Small Vacant Sites		
Land Cover Fee at Start of Permit Term <sup>3</sup>	\$13,630 per acre	\$9,450 per acre	\$3,453 per acre	\$44,355 per acre	
Endowment Fee Component at Start of Permit Term <sup>3</sup>	\$1,595	\$1,106	\$404	\$5,190	
Plan Preparation Cost Recovery Fee Component at Start of Permit Term <sup>3</sup>	\$191	\$132	\$48	\$621	
Total Fee per Acre	\$15,416	\$10,688	\$3,905	\$50,166	
Estimated Approximate Cost per Housing Unit in Cities <sup>4</sup>	\$3,854	\$2,672	\$976	\$16,396	
Estimated Approximate Cost per Housing Unit in County (Low/High) <sup>5</sup>	\$7,708 / \$46,248	\$5,344 / \$32,064	Not applicable	\$32,791 / \$196,746	
Estimated Acres of Impact in Fee Zones (Zone A, B, and C) over the Permit Term <sup>6</sup>	5,670 acres	11,400 acres	600 acres	675 acres	17,670 acres <sup>7</sup>
Estimated Land Cover Fee Revenue <sup>8,9</sup> (2010 dollars) over the Permit Term	\$59,320,000	\$104,470,000	\$1,550,000	\$29,270,000	\$194,610,000

## Notes:

- <sup>1</sup> As defined in **Figure 9-1** and in Chapter 9. Zone names are provided only as a general guide to dominant land cover (**Figure 9-2**). The nitrogen deposition fee is also assessed in every zone for applicable covered activities.
- <sup>2</sup> Serpentine fee will be charged in addition to the base land cover fee for the zone where the project is located for any impacts in serpentine land cover types (serpentine bunchgrass grassland, serpentine chaparral, serpentine seep, and serpentine rock outcrop). Serpentine land cover types primarily occur in Zone A.
- <sup>3</sup> See *Development Fee Nexus Study* for fee calculation methods. All fees will be adjusted for inflation or deflation according to **Table 9-12** and the terms of the Habitat Plan; consult planning staff with your participating jurisdiction for the latest Habitat Plan fees.
- <sup>4</sup> Assumes average housing density of 4.0 units per acre for Zone A, B, and C. This is an estimate only; fees will be charged on a per acre basis, not on a per unit basis.
- <sup>5</sup> Low estimate assumed a 0.5 acre lot; fee paid on entire parcel. High estimate assumes 3.0 acres of development envelope on a parcel size of 10 acres or more; fee paid on the size of the development envelope.
- <sup>6</sup> Excludes impacts associated with conservation strategy implementation. Implementation of the conservation strategy is expected to have net benefits for covered species and the Implementing Entity will not pay fees to itself for its impacts.
- <sup>7</sup> Zone A, B and C impacts. Serpentine land cover impacts are already included in this total for Zone A.
- <sup>8</sup> Estimated revenue does take into account credit that might be applied to public agencies that owe development fees but also contribute funding for conservation (e.g., County Parks). See text for details.
- <sup>9</sup> Does not include projected revenue from endowment and plan preparation fee components that are shown separately in **Table 9-5**.

**Table 9-7b.** Habitat Plan Nitrogen Deposition Fee and Estimated Revenue

Item	Amount
Nitrogen Deposition Fee per New Daily Vehicle Trip at Start of Permit Term (applied in all Fee Zones) <sup>1</sup>	\$3.19
Endowment Fee per New Daily Vehicle Trip at Start of Permit Term (applied in all Fee Zones)	\$0.37
Plan Preparation Fee per New Daily Vehicle Trip at Start of Permit Term (applied in all Fee Zones)	\$0.04
Total Fees Charged per New Daily Vehicle Trip	\$3.60
Plan Area Average Daily Trip Growth During Permit Term <sup>2</sup>	3,176,000
Projected Nitrogen Deposition Fee Revenue (2010 dollars) <sup>3</sup>	\$10,120,000
Approximate Cost per Single Family Housing Unit <sup>4</sup>	\$34

## Notes:

<sup>1</sup> See text and **Table 9-10** for fee calculation methods. All fees will be adjusted for inflation or deflation according to **Table 9-12** and the terms of the Habitat Plan; consult planning staff with your participating jurisdiction for the latest Habitat Plan fees.

<sup>2</sup> Estimate only; fees will be charged based on new average daily vehicle trips.

<sup>3</sup> Does not include revenue from endowment and plan preparation fee components that are shown separately in **Table 9-5**.

<sup>4</sup> Assumes 9.57 average daily trips per single family housing unit.



**Table 9-8. Endowment Fee Calculations**

	All Reserve Lands	Restored Wetland Only
Annual Endowment Fund Revenue Needed During Permit Term (2010\$)	\$ 720,000	\$ 10,000
Permit Term (years)	50	50
Endowment Fee Revenue Needed During Permit Term (rounded)	\$ 36,000,000	\$ 500,000
Total Projected Development Fee Revenue <sup>1</sup>	\$ 307,170,000	\$ 91,550,000
Endowment Cost Factor	0.117	0.005
Endowment Cost Factor for All Reserve Lands Excluding Restored Wetland		0.117
Endowment Cost Factor for Restored Wetland		0.122

Fee Category	Base Fee Amount	Endowment Cost Factor	Fee Component
<i><u>Land Cover Fees (per acre)</u></i>			
Zone A	\$ 13,630	0.117	\$ 1,595
Zone B	9,450	0.117	1,106
Zone C	3,453	0.117	404
Serpentine Fee (per acre)	\$ 44,355	0.117	\$ 5,190
Nitrogen Deposition Fee (per vehicle trip)	\$ 3.19	0.117	\$ 0.37
Burrowing Owl Fee (per acre)	\$ 44,596	0.117	\$ 5,218
Wetland Fee (per acre, per foot for streams)			
Willow Riparian Forest and Scrub	\$ 122,982	0.122	\$ 15,004
Central California Sycamore Alluvial Woodland	224,632	0.122	27,405
Mixed Riparian Forest and Woodland	122,982	0.122	15,004
Coastal and Valley Freshwater Marsh	150,812	0.122	18,399
Seasonal Wetland	329,966	0.122	40,256
Pond	134,965	0.122	16,466
Streams	518	0.122	63
Temporary Fee (per acre)			
Land Cover	Varies <sup>2</sup>	0.117	Varies <sup>2</sup>
Wetland	Varies <sup>2</sup>	0.117	Varies <sup>2</sup>

<sup>1</sup> Includes projected fee revenue for permanent and temporary land cover and wetland mitigation, nitrogen deposition, serpentine, and burrowing owl.

<sup>2</sup> Applicable base fee adjusted for duration of impact.

**Table 9-9. Plan Preparation Cost Recovery Fee Calculations**

Plan Preparation Costs			\$	6,350,000
Less: Section 6 Grant				1,107,648
Plan Preparation Costs Funded by Local Partners			\$	5,242,352
Mitigation Share of Plan Preparation Cost <sup>1</sup>				80%
Mitigation-Related Plan Preparation Cost			\$	4,190,000
Total Projected Development Fee Obligation <sup>2</sup>			\$	307,170,000
Plan Preparation Cost Factor				0.014
Fee Category	Base Fee Amount	Plan Preparation Cost Factor	Fee Component	
<i>Land Cover Fees (per acre)</i>				
Zone A	\$ 13,630	0.014	\$	191
Zone B	9,450	0.014		132
Zone C	3,453	0.014		48
Serpentine Fee (per acre)	\$ 44,355	0.014	\$	621
Nitrogen Deposition Fee (per vehicle trip)	\$ 3.19	0.014	\$	0.04
Wetland Fees (per acre)				
Willow Riparian Forest/Mixed Riparian	\$ 122,982	0.014	\$	1,722
Central Calif. Sycamore Woodland	224,632	0.014		3,145
Freshwater Marsh	150,812	0.014		2,111
Seasonal Wetland	329,966	0.014		4,620
Pond	134,965	0.014		1,890
Streams (per linear foot)	518	0.014		7
Burrowing Owl Fee (per acre)	\$ 44,596	0.014	\$	624

<sup>1</sup> Based on an estimate that preparing an HCP-only Plan would cost approximately 80% of the costs incurred to prepare the Habitat Plan.

<sup>2</sup> Includes land cover, serpentine, nitrogen deposition, wetland mitigation, burrowing owl and temporary development fees.

**Table 9-10. Habitat Plan Nitrogen Deposition Fee Calculation**

Serpentine Management & Monitoring Cost Mitigation Related to Nitrogen Deposition <sup>1</sup>	\$ 5,310,000
Other Mitigation Costs Related to Nitrogen Deposition <sup>2</sup>	<u>14,930,000</u>
Total Mitigation Costs Related to Nitrogen Deposition	\$ 20,240,000
Share of Nitrogen Deposition from Plan Area <sup>3</sup>	<u>50%</u>
Plan Area Share of Nitrogen Deposition Mitigation Costs	\$ 10,120,000
Plan Area Vehicle Trip Growth	<u>3,176,000</u>
<b>Nitrogen Deposition Fee per New Vehicle Trip</b>	<b>\$ 3.19</b>

<sup>1</sup> Additional per-acre management and monitoring costs for serpentine land covers estimated at \$2,148 (\$4,360 total serpentine costs minus \$2,212 average cost for other land covers). An estimated 2,704 acres of serpentine land in the Reserve System is for mitigation based on estimated serpentine land cover impacts and a 4:1 mitigation ratio. Total additional management and monitoring costs for serpentine mitigation lands in the reserve is \$5.81 million (\$2,148 x 2,704).

<sup>2</sup> Includes 20% of mitigation costs for land covers known to be sensitive to nitrogen deposition, and 10% of mitigation costs for land covers that may be sensitive to nitrogen deposition. See *Development Fee Nexus Study* for more details.

<sup>3</sup> Based on calculations in **Appendix E**.

**Table 9-11.** Wetland Fees by Land Cover Type

Land Cover Type	Total per Unit Cost <sup>1</sup>	Required Compensation Ratio for Restoration/Creation <sup>2</sup>	Restoration Fee per Unit of Impact <sup>3</sup>	Endowment Component <sup>4</sup>	Plan Preparation Component <sup>5</sup>	Total Fee	Method for Determining Fee Boundary
Willow and mixed riparian forest, woodland, and scrub	\$122,982/acre	1:1	\$122,982/acre	\$15,004/acre	\$1,722/acre	\$139,708/acre	Limit of tree or shrub canopy (drip line)
Central California sycamore alluvial woodland	\$112,316/acre	2:1	\$224,632/acre	\$27,405/acre	\$3,145/acre	\$225,182/acre	Limit of tree or shrub canopy (drip line)
Coastal and valley freshwater marsh	\$150,812/acre	1:1	\$150,812/acre	\$18,399/acre	\$2,111/acre	\$171,322/acre	Wetland boundary as determined through methods described in Section 6.8.4
Seasonal wetland	\$164,983/acre	2:1	\$329,966/acre	\$40,256/acre	\$4,620/acre	\$374,842/acre	Same as for coastal and valley freshwater marsh
Ponds	\$134,965/acre	1:1	\$134,965/acre	\$16,466/acre	\$1,890/acre	\$153,321/acre	Same as for coastal and valley freshwater marsh
Streams	\$518/linear foot	1:1	\$518/linear foot	\$63/linear foot	\$7/linear foot	\$588/linear foot	Stream length measured along stream centerline

<sup>1</sup> See *Development Fee Nexus Study* for restoration cost assumptions and calculation of total cost for each land cover type.

<sup>2</sup> Source: **Table 5-13.**

<sup>3</sup> Restoration cost multiplied by compensation ratio.

<sup>4</sup> Source: **Table 9-8.**

<sup>5</sup> Source: **Table 9-9.**

**Table 9-12. Fee Adjustment Indices**

Fee	Annual Adjustment Index <sup>1</sup>	Historic Range of Index (Years)	Average Annual Rate of Index (Years)
Land Cover, Serpentine, and Nitrogen Deposition Fees			
a. Portion for Land Acquisition <sup>2</sup> (46% initially <sup>3</sup> )	Change in the annual House Price Index (HPI) for the San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area (MSA) for the prior calendar year (Federal Housing Finance Agency) <sup>4</sup>	–12.74% to 33.96% (1977 to 2009)	8.33% (1977 to 2009)
b. Portion for Preserve System Operation, Restoration, and Maintenance (54% initially <sup>3</sup> )	Change in the Consumer Price Index for the San Francisco-Oakland-San Jose Combined Statistical Area for all urban consumers for the prior calendar year (U.S. Bureau of Labor Statistics) <sup>5</sup>	–10.0% to 18.35% (1915 to 2009)	3.57% (1915 to 2009)
Wetland and Burrowing Owl Fees	Same as b (Consumer Price Index)		
Notes:			
<sup>1</sup> Habitat Plan fees to be adjusted on an annual basis by a date determined by the Implementing Entity's Governing Board within the first 6 months of Plan implementation based on the indices for the prior calendar year.			
<sup>2</sup> Direct land acquisition costs only. Excludes costs associated with land transaction, site improvements, and due diligence (e.g., pre-acquisition surveys).			
<sup>3</sup> The portion of the base development fee and temporary impact fee that will be adjusted according to the HPI and CPI will vary over time. For the first annual automatic adjustment, 46% of the initial fees will be adjusted according to the HPI and 54% will be adjusted according to the CPI. The apportionment in subsequent years will depend on the proportional estimate of land cost to the rest of Plan costs.			
<sup>4</sup> See < <a href="http://www.fhfa.gov">http://www.fhfa.gov</a> >. Data for the prior calendar year are published in March.			
<sup>5</sup> Consumer Price Index, All Items, with base data year of 1982–1984 (i.e., 1982–1984 = 100), for all urban consumers (CPI-U), not seasonally adjusted. See < <a href="http://www.bls.gov/">http://www.bls.gov/</a> >.			

**Table 9-13.** Federal and State Funding Sources for HCPs and NCCPs in California

Program Name	Program Administrator	Funding Source	Funding Available in California	Year	Description	Eligibility	Santa Clara Valley Habitat Plan Potential
Endangered Species Act Section 6 Grants	U.S. Fish and Wildlife Service, California Department of Fish and Game	Federal	\$194,891,458	2007–2011 annual average	Grants for HCP land acquisition; current USFWS policy requires non-federal match of 25% that cannot be from local mitigation fees.	HCPs	Strong
Land and Water Conservation Fund	California Department of Parks and Recreation	Federal	\$1,275,155	2007	Dollar-for-dollar matching grants for planning, acquisition, and development of outdoor recreation areas and facilities	Cities, counties and districts with authority to acquire, develop, operate and maintain public park and recreation areas	Moderate; used by County Parks in past
Farm and Ranch Land Protection Program	Natural Resource Conservation Service	Federal	\$2,407,474	2007	USDA provides up to 50% of conservation easement value; requires partnerships with other agencies.	Active farm and ranch lands	Very limited
Environmental Quality Incentives Program	Natural Resource Conservation Service	Federal	\$74,384,767	2011	Financial assistance to plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland.	Owners of active agricultural, forest production, or ranch lands that have a natural resource concern.	Uncertain; higher likelihood for projects that align with annual natural resource concern initiatives
Wildlife Habitat Incentive Program	Natural Resource Conservation Service	Federal	\$3,601,152	2011	Provides technical and financial assistance to landowners and others to develop upland, wetland, aquatic, and other types of habitat that supports fish and wildlife populations of National, State, Tribal, and local significance.	Private agricultural land including cropland, grassland, rangeland, pasture, and other land suitable for fish and wildlife habitat development, nonindustrial private forest land including rural land that has existing tree cover or is suitable for growing trees, and Indian land.	Uncertain

Table 9-13. Continued

Program Name	Program Administrator	Funding Source	Funding Available in California	Year	Description	Eligibility	Santa Clara Valley Habitat Plan Potential
North American Wetlands Conservation Act Grant Program	U.S. Fish and Wildlife Service	Federal	\$9,485,299	2006–2007	Program provides matching grants to aid in wetland conservation projects, including land acquisition, restoration, and enhancement. Non-federal match must be at least 1:1.	Non-federal agencies, organizations, or individuals	Uncertain
Landscape Conservation Cooperatives	U.S. Fish and Wildlife Service	Federal	\$18,000,000	2011–2012	New program to apply strategic habitat conservation through partnerships with other federal agencies, states, tribes, NGOs, and stakeholders. Program established to improve science and management decisions in response to climate change.	Habitat Plan within California Landscape Conservation Cooperative, one of 16 established throughout the country.	Uncertain
Central Valley Project (CVP) Improvement Act Habitat Restoration Program	U.S. Fish and Wildlife Service and U.S. Bureau of Reclamation	Federal	\$1,000,000–4,000,000 annually	1996 to present	Provides funds for land acquisition, management, monitoring, research, restoration for endangered / threatened species impacted by the CVP.	Federal and State government agencies, private non-profit or profit organizations, and individuals	Strong
Sustainable Communities Planning Grant Program	U.S. Department of Housing and Urban Development	Federal	\$100,000,000 nationwide	2011	Provides funds to cities and counties to improve regional planning efforts that increase the capacity to improve land use and zoning.	Undetermined; new program	Unknown
Habitat Conservation Fund	California Department of Parks and Recreation	State, Other <sup>1</sup>	\$2,000,000	2007	Program requires dollar for dollar match from non-state source for wetlands, riparian, trails/programs and anadromous/trout categories.	Cites, counties and districts	Moderate; used by County Parks in past

Table 9-13. Continued

Program Name	Program Administrator	Funding Source	Funding Available in California	Year	Description	Eligibility	Santa Clara Valley Habitat Plan Potential
Recreational Trail Fund	California Department of Parks and Recreation	Federal <sup>2</sup>	\$6,037,429	2008	Federal money for non-motorized trail projects; RTP will provide up to 80% of total project costs.	Cities, counties, districts, state agencies and nonprofit organizations with management responsibilities over public lands	Moderate; used by County Parks in past
San Francisco Bay Area Conservancy <sup>3</sup>	California Coastal Conservancy	State, Proposition 40	\$40,000,000	Total funding allocation through time	Funding from Proposition 40 and Proposition 50 for acquisition, development, rehabilitation, restoration and protection of land resources and for Bay Area coastal watershed and wetlands protection, plus acquisition of agricultural and open space properties.	The State Coastal Conservancy, public agencies and nonprofit organizations (land trusts)	Nearly fully encumbered, but \$1.6 million is budgeted for projects that may be compatible with the Habitat Plan. Used by County Parks in past.
Soap Lake Floodplain Preservation Grant Program	Pajaro River Watershed Flood Prevention Authority	State, Proposition 50 (Chapter 8)	\$3,500,000	2008	Grants for land acquisition and easements in Soap Lake area (Santa Clara and San Benito Counties)	TBD	Likely strong
CalFed Bay-Delta Programs	California Bay Delta Authority and other California agencies	State, Proposition 50	\$270,000,000	Total funding allocation through time	Various programs funded by Proposition 50 for habitat restoration and protection, conservation and restoration of watersheds.	State, federal, local and non-governmental agencies are eligible.	Moderate



Table 9-13. Continued

Program Name	Program Administrator	Funding Source	Funding Available in California	Year	Description	Eligibility	Santa Clara Valley Habitat Plan Potential
Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 - Forest and Wildlife Conservation	Wildlife Conservation Board, State Coastal Conservancy, California Department of Parks and Recreation	State, Proposition 84	\$450,000,000	Total funding allocation through time	Proposition 84 provides various funding allocations for forest conservation and protection projects and development, rehabilitation, restoration, acquisition and protection of habitat. This includes specific funding for NCCP implementation. \$10 million allocated to Wildlife Conservation Board for NCCPs in 2009 state budget.	\$180,000,000 is allocated for forest conservation and protection projects; \$135,000,000 is allocated for development, rehabilitation, restoration, acquisition and protection of habitat; \$90,000,000 is allocated for NCCP establishment or implementation; \$45,000,000 is allocated for the protection of ranches, farms, and oak woodlands;	Strong
Same as above	Strategic Growth Council	State, Proposition 84 (Chapter 8)	\$60,000,000	2010–2013	The Sustainable Communities Planning Grant and Incentive Program.	The program provides \$48 million to support development and implementation of local plans to help the state meet AB32 greenhouse gas emission reduction targets and implement SB375. Cities and counties developing or implementing NCCPs are eligible.	Strong
“Mountain Lion Fund”	State Coastal Conservancy, California Department of Parks and Recreation, Wildlife Conservation Board	State, Proposition 117	\$30,000,000	Annual funding through 2020	Proposition 117 provides at least \$30 million statewide each year for wildlife habitat preservation, including wetlands, stream and riparian habitat. Half must be spent in northern California.	\$21 million is allocated to the WCB for purposes of the Dept. of Fish and Game. \$4.5 million is allocated for local park, recreation and open space agencies as matching awards from the state. \$4.5 million is for the Coastal and Tahoe Conservancy.	Moderate; used by County Parks once in 1990’s for joint acquisition with MROSD (Jacques Ridge property)

**Table 9-13.** Continued

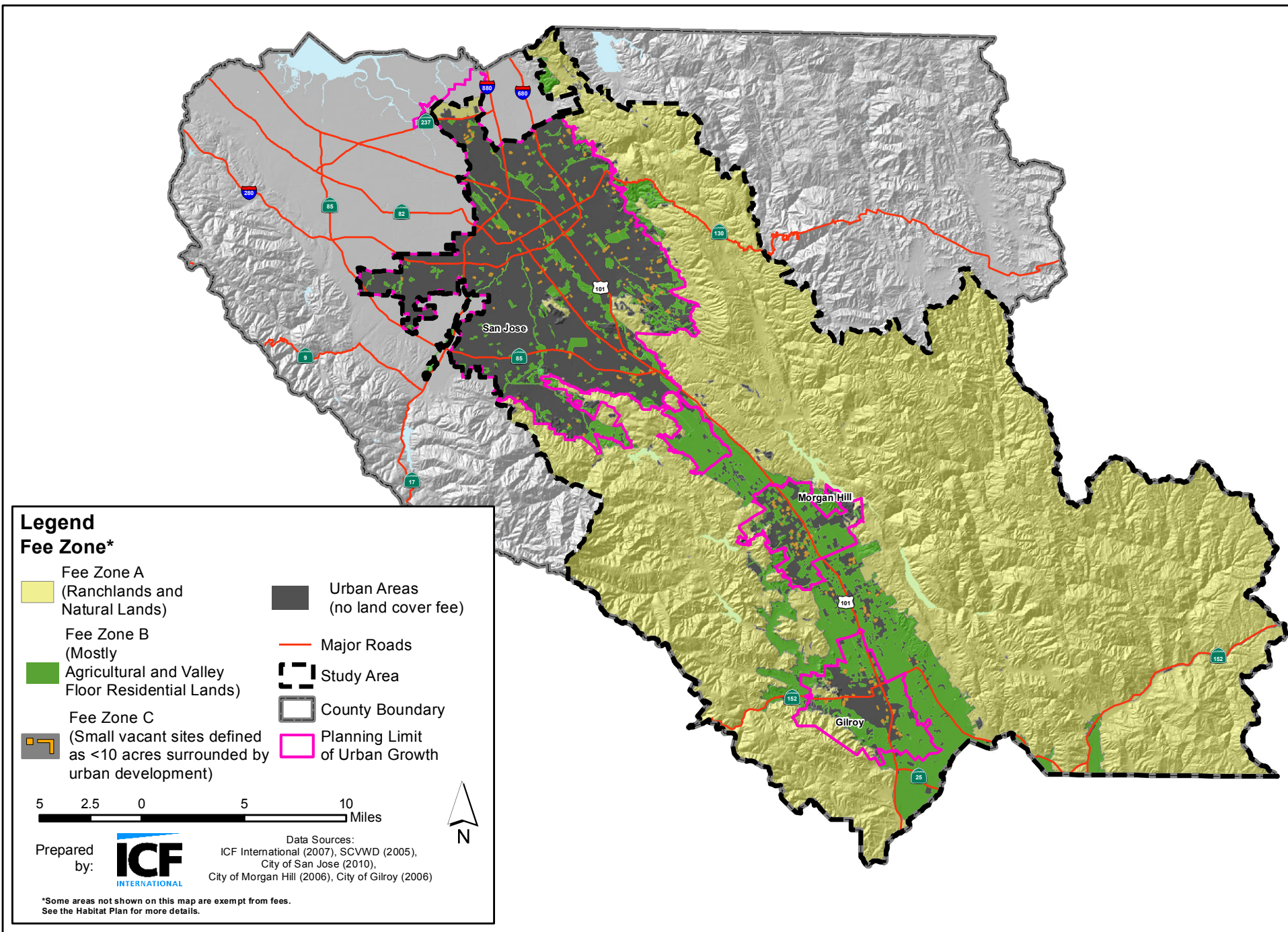
Program Name	Program Administrator	Funding Source	Funding Available in California	Year	Description	Eligibility	Santa Clara Valley Habitat Plan Potential
Clean Water State Revolving Fund	Environmental Protection Agency	Revolving fund	\$67,105,000	2007	Revolving fund provides low-interest loans for projects that improve water quality and reduce nonpoint source pollution, including wetland preservation, restoration and creation, and the protection of vernal pools and associated habitat such as oak woodlands. Loans can cover 100% of project costs with no cash up front.	Revolving fund loans are available to local governments, non-profits, municipalities, farmers, and homeowners.	Moderate

<sup>1</sup> Initiated by the California Wildlife Protection Act of 1990.

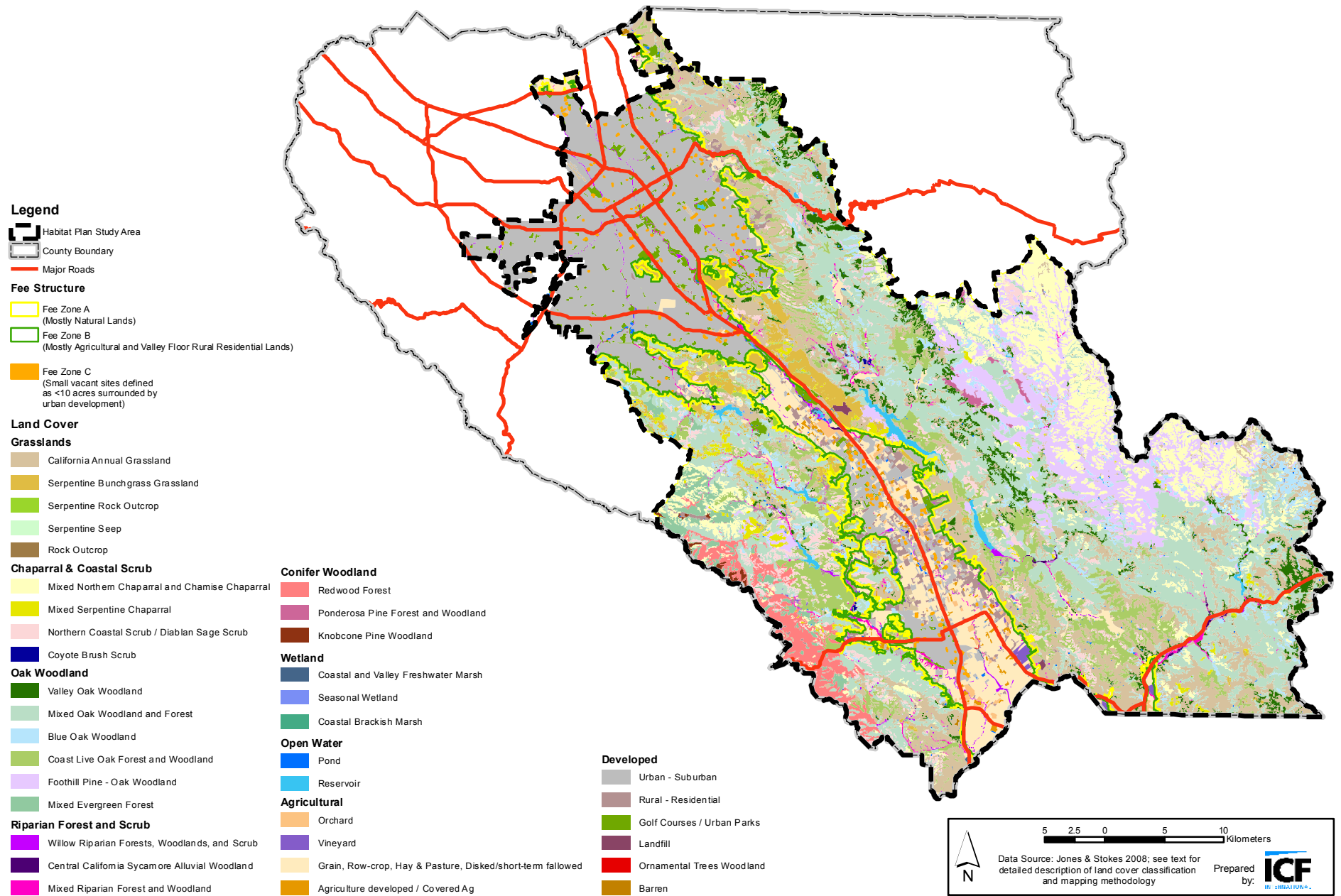
<sup>2</sup> Administered at the federal level by the Federal Highway Administration.

<sup>3</sup> The San Francisco Bay Area Conservancy obtains funds via the Statewide California Coastal Conservancy program. The broader California Conservancy program also funds other projects in the San Francisco Bay Area, though they are all directly on the coastline, not in Contra Costa County.

Sources: East Contra Costa County HCP/NCCP; MuniFinancial; County of Santa Clara Parks & Recreation Department.



**Figure 9-1**  
**Land Cover Fee Zones**



**Figure 9-2**  
**Land Cover Types and Fee Zones**

## Chapter 10

# Assurances

### 10.1 Introduction

This chapter discusses the assurances requested by the Permittees that will accompany the ESA Section 10(a)(1)(B) permits issued by USFWS and the NCCP permit issued by CDFG. This chapter also discusses assurances that will be provided to private landowners bordering Habitat Plan reserves, and outlines the process for changing or amending the Habitat Plan.

### 10.2 Assurances Requested by Permittees

The Permittees are requesting the following assurances from the Wildlife Agencies. Assurances specific to state or federal agencies are requested in Sections 10.2.3 *Federal Section 7 Consultations* (USFWS) and 10.2.7 *Assurances for Private Landowners* (CDFG).

#### 10.2.1 Changed and Unforeseen Circumstances

##### Changed Circumstances

Changed circumstances are defined in the federal No Surprises Regulation<sup>1</sup> and for the state of California in the NCCP Act<sup>2</sup>. The federal No Surprises Regulation defines changed circumstances as those circumstances affecting a species or geographic area covered by the HCP that can be reasonably anticipated by the applicant or federal wildlife agencies and that can be planned for. Similarly, state regulation defines changed circumstances as those circumstances that are reasonably foreseeable and could affect a covered species or geographic area covered by the plan. Accordingly, these regulations require that potential changed circumstances be identified in the Plan along with remedial measures that would be taken to address these changes. The changed circumstances that could arise in the study area have been identified and are described below.

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<sup>1</sup> 63 Federal Register 35 (1998) (amending 50 CFR 17.22(b)(5), and 222.307(g)).

<sup>2</sup> California Fish and Game Code § 2805(c).



If a changed circumstance occurs within the study area as defined by these sections, the Implementing Entity will notify the Wildlife Agencies of this changed circumstance within seven days after learning that any changed circumstances defined by these sections has occurred. The Implementing Entity will modify its activities in the manner described below, to the extent necessary to address the effects of the changed circumstances on the Plan's conservation strategy, and will report to the Wildlife Agencies on its actions. The Implementing Entity will make such modifications without awaiting notice from the Wildlife Agencies. Pursuant to the No Surprises Regulation, if such changed circumstances were addressed in the Habitat Plan and they occur during the permit term, implementation of their remedial measures is required. The Wildlife Agencies will not require any additional conservation or mitigation to address changed circumstances that are not identified in the Plan, without the consent of the Permittee, as long as the Plan is found to be properly implemented. *Properly implemented* means that the commitments and the provisions of the Plan, Implementing Agreement, and permits have been or are being fully implemented. In addition, the Wildlife Agencies will not require measures to address changed circumstances that are identified in the Plan beyond the remedial measures identified in the Plan.

## Unforeseen Circumstances

Unforeseen circumstances are defined by federal regulation (50 CFR §17.3) as:

changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that could not reasonably have been anticipated by plan or agreement developers and the Service at the time of the conservation plan's or agreement's negotiation and development, and that result in a substantial and adverse change in the status of the covered species.

The NCCP Act (California Fish and Game Code Section 2805[j]) defines unforeseen circumstances as:

changes affecting one or more species, habitat, natural community, or the geographic area covered by a conservation plan that could not reasonably have been anticipated at the time of plan development, and that result in a substantial adverse change in the status of one or more covered species.

In the event of unforeseen circumstances during the permit term, amendments to the Habitat Plan may be proposed by either the Implementing Entity or the Wildlife Agencies to address these circumstances. The Wildlife Agencies and the Implementing Entity would work together to identify opportunities to redirect resources to address unforeseen circumstances. However, the Permittees request assurances consistent with the federal No Surprises Regulation and the NCCP Act that the Wildlife Agencies will not:

- require the commitment of additional land, water, or financial compensation by the Permittees in response to unforeseen circumstances other than those agreed to elsewhere in the Habitat Plan; or
- impose additional restrictions on the use of land, water, or natural resources otherwise available for use by the Permittees under the original terms of the Habitat Plan to mitigate the effects of the covered activities or in response to unforeseen circumstances.

As described in the No Surprises Regulation, it is the Wildlife Agencies' responsibility to demonstrate the existence of unforeseen circumstances using the best scientific and commercial data available. For the purpose of this plan, "unforeseen" circumstances are circumstances that are highly unlikely and not reasonably foreseeable to occur and thus will not be funded by this Plan.

The federal No Surprises Regulation does not limit or constrain the USFWS or any federal, state, local, or tribal government agency, or private entity, from taking additional actions at its own expense to protect or conserve covered species. The federal No Surprises Regulation also does not prevent USFWS from asking the Permittees to voluntarily undertake additional mitigation on behalf of the affected species.

## Changed and Unforeseen Circumstances Addressed by this Plan

The changed and unforeseen circumstances listed below are recognized by this Plan (**Table 10-1**). Remedial actions to address changed circumstances are funded by the Plan and are also described below. The Implementing Entity will maintain sufficient financial reserves to fund all remedial actions described below, as they arise. A discussion of each circumstance follows.

- Covered Species Listed.
- Non-Covered Species Listed.
- Global Climate Change.
- Fire.
- Nonnative Species or Disease.
- Flooding.
- Drought.
- Earthquakes.

Other potential changed circumstances were considered but rejected. For example, emergency situations and their corresponding remedial actions are not addressed under the Plan. While we can predict that over the course of a 50-year permit term there will be emergency situations, it is impossible to predict exactly what these emergencies will be. Past emergency situations in the study area that have resulted in the take of covered species include chemical spills, oil

run-off, and spills of garlic processing waste in creeks. Because of the difficulty predicting the size, type, frequency and effect of emergency situations, the Permittees do not consider such events to be changed circumstances under the Plan. If such an event occurs as a result of a Permittee facility or action, the Permittee is responsible for any take that may occur. Each Permittee will assume responsibility for the emergency situation and remedial measures if and when they do occur in the future, just as they would if there were no HCP/NCCP.

## Covered Species Listed

Each covered species in the Habitat Plan has been treated as though it is listed under ESA and CESA. The Permittees propose that all listed and nonlisted covered species be included on the permits. Take of listed plant species by non-federal entities is not prohibited under ESA and therefore the Permittees do not require take authorization. The following plant species are proposed to be included on the federal permits in recognition of the conservation benefits provided for them under the Plan. These species would also receive No Surprises assurances under USFWS's No Surprises Regulation (63 FR 8859-8873; see Section 10.2.3 *Federal Section 7 Consultations* in this chapter).

- Tiburon Indian paintbrush (*Castilleja affinis* subsp. *neglecta*)
- Coyote ceanothus (*Ceanothus ferrisiae*)
- Mount Hamilton thistle (*Cirsium fontinale* var. *campylon*)
- Santa Clara Valley dudleya (*Dudleya setchellii*)
- Fragrant fritillary (*Fritillaria liliacea*)
- Loma Prieta hoita (*Hoita strobilina*)
- Smooth lessingia (*Lessingia micradenia* var. *glabrata*)
- Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*)
- Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*)

The Permittees propose that the Section 10(a)(1)(B) permit be effective for all listed covered species immediately after the adoption of all local implementing ordinances (see Chapter 8, Section 8.5 *Local Implementing Ordinances*). Should USFWS list a covered species during the permit term, take coverage will become effective for that species once the Conference Opinion for that species is converted to a Biological Opinion. No changes to the terms and conditions of the Implementing Agreement or modifications to conservation measures are required.

Under Section 2835 of the California Fish and Game Code, CDFG may issue take authorization for covered species (plants or wildlife) regardless of their listing status. As stated in the NCCP Act, "At the time of plan approval, the [California] department [of Fish and Game] may authorize by permit the taking of any covered species whose conservation and management is provided for in a natural community conservation plan approved by the department."



## Non-Covered Species Listed

Over the course of Plan implementation (50 years), the Wildlife Agencies may list as threatened or endangered under ESA or CESA species that are not covered under the Plan. If a non-covered species becomes listed, the following remedial measures will be taken.

- The potential impacts of covered activities on the newly listed species will be evaluated, including an assessment of the presence of suitable habitat in impact areas.
- The Implementing Entity will develop measures to fully avoid impacts on the newly listed species until the Plan is amended to cover the species or will comply with ESA and CESA via other means (i.e., individual Section 7 consultations, consistency determinations, etc.).

Should a species not covered by the Plan be listed, proposed, or petitioned for listing, the Permittees may request that the Wildlife Agencies add the species to the Section 10(a)(1)(B) permit and NCCP permit. In determining whether or not to seek incidental take coverage for the species, the Permittees will consider, among other things, whether the species is present in the study area and if otherwise lawful activities could result in incidental take of the species. If incidental take coverage is desired, the Plan and permits could be modified or amended. Alternatively, the Permittees could apply for new and separate permits. Procedures for modifications and amendments to the Plan are outlined in Section 10.3 *Modifications to the Plan* below.

## Global Climate Change

Global climate change is occurring as a result of high concentrations of greenhouse gases in the Earth's atmosphere (National Research Council 2010; Intergovernmental Panel on Climate Change 2007). Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, and ozone. These gases absorb energy emitted by the Earth's surface, and then re-emit some of this energy back to Earth, warming the Earth's surface, and influencing global and local climates. As more and more greenhouse gases are emitted into the atmosphere from human activities such as the burning of fossil fuels, the Earth's energy balance is disrupted, resulting in a number of changes to the historical climate. Evidence of long-term changes in climate over the twentieth century include the following (Intergovernmental Panel on Climate Change 2007; National Research Council 2010; Global Change Research Program 2009):

- An increase of 0.74 degree Celsius (°C) (1.3 degrees Fahrenheit [°F]) in the Earth's global average surface temperature;
- An increase of 0.17 meter (6.7 inches) in the global average sea level;
- A decrease in arctic sea-ice cover at a rate of approximately 4.1% per decade since 1979, with faster decreases of 7.4% per decade in summer;

- Decreases in the extent and volume of mountain glaciers and snow cover;
- A shift to higher altitudes and latitudes of cold-dependent habitats;
- Longer growing seasons; and
- More frequent weather extremes such as droughts, floods, severe storms, and heat waves.

Current global and regional trends suggest that climate change is likely to have an effect on the study area (see **Appendix F** for a complete discussion). However, current or near-term forecasting technology for modeling changes in climate at the regional or county scale is not effective. By mid-century, the average annual mean temperature in California is projected to rise from 1.1°C (2°F) to more than 2.8°C (5°F), with little to no change in total annual precipitation (Luers et al. 2006). There is significant variability in the precipitation projections by individual model and emissions scenario. Individual simulations suggest that there could be up to a 10 to 20% decrease in total annual precipitation (Luers et al. 2006)<sup>3</sup>. Model predictions for California range from a 6mm (0.24 inches) annual decrease in precipitation to a 70 mm (2.76 inches) annual increase (Hayhoe et al. 2004). Consequently, it is likely that the climate in the study area would shift to be warmer and dryer.

A number of ecological responses to climate change could occur in the study area. First, the timing of seasonal events, such as migration, flowering, and egg laying, may shift earlier or later (Walther et al. 2002; Forister and Shapiro 2003; Root et al. 2003; Root et al. 2005). Such shifts may affect the timing and synchrony of events that must occur together, such as butterfly emergence and nectar availability. Second, range and distribution of species and natural communities may shift (Parmesan 1999; Pimm 2001; Walther et al. 2002; Easterling et al. 2000). Range is the area over which a species occurs or potentially occurs, whereas distribution refers to where a species is located within its range. This is of particular concern for narrowly distributed species that already have restricted ranges due to urban growth or altitudinal gradients. Historically, some species could shift their ranges across the landscape. Today, urban and rural development prevents the movement of many species across the landscape. Species or natural communities that occur only at high elevation (e.g., ponderosa pine woodland in the study area) or within narrow environmental gradients (e.g., Bay checkerspot butterfly, Mount Hamilton thistle) are particularly vulnerable to changing climate because they likely have nowhere to move if their habitat becomes less suitable (Shainsky and Radosevich 1986; Murphy and Weiss 1992; Thorne 2006, PIER Conference; J. Hillman pers. comm.).

Second, increases in disturbance events, such as fire or flooding, could increase the distribution of disturbance-dependent land cover types, such as redwood

<sup>3</sup> The California Climate Change Center report summarizes projections using the National Center for Atmospheric Research Parallel Climate Model (PCM1), Geophysical fluids Dynamic Laboratory (GFDL) CM2.1, and the United Kingdom Met Office Hadley Centre Climate Model, version 3 (HadCM3) under the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emission Scenarios (SRES) B1 (low emissions), A2 (moderately-high emissions), and A1Fi (high emissions).

forest and annual grassland, within the study area (Brown and Hebda 1998; Lenihan et al. 2003; Fried et al. 2004; California Climate Change Center 2006; Rogers and Westfall 2007). An increase in the frequency and intensity of disturbance could increase the likelihood that these events will harm or kill individual covered species, many of which are already quite rare. Events that occur with unpredictable or random frequency (called stochastic events) such as those describe above can have an inordinately negative effect on rare species.

Third, the number or density of individuals found in a particular location may change. This may be triggered in large part by changes in resource availability associated with an increase or decrease in precipitation (Martin 1998; Dukes and Mooney 1999; Walther et al. 2002; Lenihan et al. 2003; Millar et al. 2006; Pounds et al. 2006). Changes such as these may benefit one species at the expense of another.

Fourth, over a longer time period, species may change in outward appearance and behavior. Changes in climate may favor different adaptive strategies or appearances that may lead to genetic shifts (Davis and Shaw 2001). An example of this would be a shift to smaller average body size of certain mammals to use limited food sources for maintenance rather than growth.

The conservation strategy, reserve design, and monitoring and adaptive management program anticipate possible effects of climate change using a multi-scale approach that views conservation through landscape, natural-community, and species level. This approach focuses on protecting and enhancing a range of natural communities, habitat types, and environmental gradients (e.g., altitude, aspect, slope), as well as other features that are important as global warming changes the availability of resources and habitat types in the study area.

Implementing conservation actions that protect a variety of landscapes over a large scale provides flexibility for shifts in range and distribution of species and natural communities due to climate change. Land-acquisition actions target properties that provide connectivity to allow for northward and upslope movement, maintenance and restoration of habitat linkages, and reduced habitat fragmentation. In addition, habitat types across environmental gradients would be targeted for acquisition in the Reserve System to provide topographic diversity, thereby reducing the chance of population extinction (Murphy and Weiss 1992). As a result, some species and natural communities in the study area would continue to be able to “move” in response to climate change, allowing for shifts in range and distribution.

At the natural-community level, conservation and monitoring actions were developed to address natural communities primarily through the enhancement, restoration, and management of vegetation types (i.e., land cover types) and monitoring those changes. Habitats will be managed to ensure natural community and species persistence in the face of abundance shifts driven by climate change. Enhancement, restoration, and management actions will likely increase the resilience of natural communities by improving habitat quality overall and controlling invasive plants and nonnative predators.

At the species level, conservation and monitoring actions were developed to supplement and focus actions developed at broader scales and to ensure that all the needs of particular species are addressed. These species-specific actions will help ensure that shifts of range, distribution, and abundance driven by climate change are buffered by protection and enhancement of individuals, populations, and groups of populations. Status and trends monitoring will serve as an early warning for the possible effects of climate change and will allow the conservation strategy to adapt to ensure species persistence in the study area.

In addition to the conservation actions, monitoring actions will allow for the early detection of trends driven by climate change over multiple scales. Landscape-level monitoring is designed to detect large-scale changes, such as changes in ecosystem processes, shifts in natural-community distribution, and the integrity of landscape linkages. Community-level monitoring would, in turn, detect changes in the composition and function of natural communities, populations of key predator or prey populations, invasive species, and other important habitat factors for covered species. Finally, species-level monitoring would measure the effects of management actions on covered species and the status and trends of covered species in the Reserve System. Collectively, these monitoring actions will allow the Implementing Entity to detect and respond to the effects of climate change. Taken together, conservation and monitoring actions described above will help buffer against the effects of climate change in the study area.

Climate change is considered a foreseeable event and is therefore a changed circumstance. For the purposes of the Plan, limits on the changed circumstance must be identified.

The Implementing Entity will use a method consistent with the California Climate Action Team<sup>4</sup> for measuring temperature change within the study area. The baseline index, as measured from the Gilroy, Morgan Hill, and San José weather stations, will be historic temperatures from 1961 to 1990. For the purposes of the Plan, three baseline measurement periods will be set using 1961 to 1990 historic temperatures: average annual temperature, average summer temperature (June, July, and August), and average winter temperature (December, January, and February). If modeled California climate-change trends are applied to the study area, one may anticipate that the temperature could increase up to 2.8°C during the permit term. Under the Plan, the following is considered changed circumstances for which remedial measures will be funded.

- An increase in temperature of up to 2.8°C for any of the three baseline periods measured as a 10-year running average.

The Implementing Entity's response to the changed circumstance of global climate change will vary by the character and magnitude of the physical and biological changes observed. Responses may include those listed below. All responses will occur within one year of identifying changed circumstances, unless the Wildlife Agencies concur on a case-by-case basis that specific remedial actions would require more time to initiate.

<sup>4</sup> [http://www.climatechange.ca.gov/climate\\_action\\_team/index.html](http://www.climatechange.ca.gov/climate_action_team/index.html)

- Enhanced monitoring to detect ecological responses to climate change (see Chapter 7).
- Identification of target species most vulnerable to climate change and increased status-and-trend monitoring for those species.
- Alterations to the conceptual ecological models for natural communities and covered species as a tool to devise improved management actions (see Chapter 7).
- Altered or more intensive management actions on target/vulnerable species to facilitate shifts in species distribution (e.g., more active population management of covered species).
- More aggressive control of invasive species that respond positively to climate change.
- Implement other measures through the Adaptive Management Program (see Chapter 7) in ways consistent with permit obligations and with the consent of the Implementing Entity.

Thresholds for events that are not reasonably foreseeable have been established for determining unforeseen circumstances. Unforeseen circumstances not funded by the Plan include the following.

- A temperature increase greater than 2.8°C will be considered an unforeseen circumstance. Temperature increases will be measured for the three baseline periods measured as a 10-year running average.

Limits on the variation in other parameters (e.g., rainfall) are much more difficult to determine. Given the seasonality of rainfall in the study area, an increase in winter precipitation may be offset by increased evapotranspiration during the summer months (Intergovernmental Panel on Climate Change 2007). A decrease in winter precipitation would be exacerbated by increased summer temperatures, leading to increased drought. Therefore, it is not possible at this time to define limits of rainfall patterns that would qualify as unforeseen circumstances. Regardless of increases or decreases in precipitation, it is anticipated that the number of strong storm events would increase during the winter season (Kim 2005). These events are more likely to result in flooding than in increased soil percolation or water storage recharge (California Natural Resources Agency 2009). Increased frequencies of flooding and drought are taken into account in the sections below addressing these changed circumstances.

## Fire

Fire is a natural component of many ecosystems and natural community types, including grasslands, chaparral/northern coastal scrub, oak woodlands, and conifer woodlands. For each of these natural communities, fire frequency and intensity influence community regeneration, composition, and extent. To ensure that fire-dependent natural community processes occur, minimum suppression techniques and prescribed burning will be implemented as part of the Conservation Strategy (e.g., see Conservation Action LM-8 in Chapter 5).

However, it is possible that large, intense, and frequent fires could have a negative impact on natural communities and restoration projects. For example, more frequent, intense fires caused by high fuel loads and increased encroachment by woody species into grasslands could negatively affect community composition by favoring early successional species. Additionally, frequent, intense fires could cause *type conversion*, increasing the extent of certain natural communities, such as grassland, at the expense of others, such as chaparral or oak woodlands.

To determine the limits of changed circumstances, the size of catastrophic fires (e.g., fires over 10,000 acres) and their frequency (i.e., return interval) was assessed for the study area. This assessment was based on both historic fire occurrence and the influence of climate change. These conservative estimates for the study area were then scaled down to fit the Reserve System.

Using a conservative estimate, the total amount of land cover within the study area that is prone to wildfires is approximately 298,016 acres. Land cover types that are not prone to wildfire (i.e., low fuel loads, high moisture content) are riparian, wetland, agriculture, and developed land cover types and were subtracted from this total. Livestock foraging and grazing land is classified as grassland under the Plan; therefore, it is included as a land cover prone to wildfires.

Within the study area, regardless of size, wildfires occur at the average rate of once every 2 years (**Figure 10-1**). CAL FIRE has rated the fire probability in undeveloped portions of the study area as moderate to high. Recent fire history<sup>5</sup> for large fires (>100 acres) indicates that there have been 35 large fires since 1951 years. Large fires ranged from 134 acres to 5,813 acres. Of these, none were over 10,000 acres (i.e., catastrophic fires)<sup>6</sup>. There were four fires that occurred either partly within the study area or immediately adjacent to the study area (e.g., in State Parks lands) that were over 10,000 acres. These fires burned a total of 112,242 acres, or 38% of the land cover types prone to wildfire (also referred to as “burnable land cover”).

Climate change must also be taken into account when predicting fire frequency in the study area. Throughout California, fire occurrence can be correlated with drought, moisture availability, and biomass (fuel) accumulation (Lenihan et al. 2003). Both “wetter and warmer” and “drier and warmer” climate change scenarios are predicted for the study area (Hayhoe et al. 2004). The warmer, drier scenario would increase the occurrence of drought, while increased biomass production would result from the warmer, wetter scenario. Both of these scenarios have the potential to increase fire frequency due to either increase drought frequency or increase in biomass accumulation. For the purposes of the calculation of changed and unforeseen circumstance, it is assumed that fire frequency will increase in the study area due to climate change.

<sup>5</sup> Calculations were based on data from 1956–2011.

<sup>6</sup> Catastrophic fires occurred as follows: 32,866 acres in 1961 (Bollinger Ridge), 13,128 acres in 1985 (Lexington), 18,500 acres in 2003 (Annie), and 47,748 acres in 2007 (Lick).

With climate change, it is assumed that fire occurrence frequency and area burned will increase by 25%. Recent literature analyzing the relationship between climate change and fire frequency in California identified a median fire occurrence and burned area increase of 30% by 2050 (Westerling et al 2009). This is a statewide estimate with fire occurrence increases ranging from 11% to 55% and burned area increases ranging from 11% to 70%. The largest increases for both fire occurrence and burned area are expected to occur in the Sierra Nevada, Northern California Coast and south Cascade Ranges. These increases are expected to occur by 2050.

The potential effects of climate change on fire frequency are anticipated to increase over the course of the permit term. At the beginning of the permit term, limited change from historic fire occurrences and burned area may be acceptable as a changed circumstance; however, the potential effects of climate change will grow over the permit term. In addition, at the beginning of the permit term, fire risks in Reserve System will be low because it will be smaller. As such, it is felt that a 25% increase due to climate change represents a conservative estimate for the increase in fire frequency and burned area in the Plan area for the duration of the permit term.

Based on historic fires in the study area, it is foreseeable that four catastrophic fires could occur during the permit term, each burning 4 to 14% of the land cover types prone to wildfire within the study area. Increasing these values by 25% ( $0.04 * 1.25$  and  $0.14 * 1.25$ ) to take climate change into account, the Plan anticipates up to five catastrophic fires within the study area over the course of the permit term each burning approximately 5 to 17% of the land cover types in the study area prone to wildfires (14,901 to 50,663 acres, respectively).

It is assumed that 46,141 acres within the Reserve System is burnable land cover. This includes all of the burnable land cover within lands newly acquired for the Reserve System (32,850 acres; see **Table 5-11**) plus all existing open space lands incorporated into the Reserve System (up to 13,291 acres; see **Table 5-5**). To be conservative, it is assumed that all of the land cover in existing open space is prone to wildfires, even though a portion is expected to be developed, aquatic, and riparian land cover types that are not prone to wildfires. The Reserve System represents 15% of the burnable land cover in the study area. The Reserve System will be composed of large blocks of habitat that will build off existing open space within the study area. Based on the expected reserve design, it is assumed that any one Reserve System unit will not exceed 20,000 acres. (Reserve units will be composed of Reserve System lands with similar management and monitoring needs.) Although managed similarly, these lands will not necessarily be contiguous (e.g., Coyote Ridge and Tulare Hill are anticipated to be located within the same Reserve unit, even though they are not contiguous). The largest block of contiguous parcels within any reserve unit will not exceed approximately 10,000 acres. Because the reserve system is distributed over a large geographic portion of the county, it is extremely unlikely that a single fire, even if very large, could burn a significant portion of the entire reserve unit.

For the purpose of assessing changed circumstances, this 15% is applied to anticipate fire occurrence within the Reserve System and enhanced lands.

Fifteen percent was chosen because the Reserve System represents 15% of the flammable land cover in the study area. It is assumed that only 15% of the catastrophic fires (one fire) will burn a portion of the Reserve System and enhanced lands. This one catastrophic fire would affect the same proportion of the burnable acreage of the study area as each of the five catastrophic fires projected to occur in the study area (i.e., approximately 5 to 17% or 14,901 to 50,663 acres). This suggests that 2,235 to 7,599 acres are likely to burn<sup>7</sup> in the Reserve System as a result of catastrophic fire during the permit term. As such, it is foreseeable, as a changed circumstance, that up to one fire burning 2,235 to 7,599 acres of the Reserve System could occur over the course of the permit term. A total acreage burned from a catastrophic fire exceeding 7,599 acres (16% of the Reserve System burnable land cover) within the Reserve System is highly unlikely and is not reasonably foreseeable, therefore would be considered an unforeseen event. Any number of fires, regardless of burned acreage in the Reserve System, will be remediated as a changed circumstance if enhancement, restoration or creation projects described in the conservation strategy are affected. However, remedial actions triggered by a single fire event that burns more than 7,599 acres of the Reserve System would be limited to enhancement, restoration and creation sites. The Implementing Entity would not be responsible for remediating all burned areas as a result of a fire or fires that exceed the thresholds described above.

The threshold of burned acreage in the Reserve System for the changed circumstance (7,599 acres) is a reasonable upper limit when compared to the largest fire in the County (Lick Fire, 47,748 acres) because of the differences between the expected configuration and location of the Reserve System and the location of this extreme fire event. First, the Lick Fire occurred at a higher elevation than the expected Reserve System where terrain is more rugged, drier, and supports greater fuel loads than the expected Reserve System. The elevation also contributed to the remoteness of the Lick Fire, which made it difficult to contain quickly. The Reserve System will occur in middle to lower elevations in the County that support relatively low fuel loads (e.g., a much greater proportion of annual grassland than chaparral) and with good access for fire crews. The fire size threshold also corresponds to the approximate upper limit of contiguous parcels in the Reserve System.

Fires that occur too frequently in the same area may result in type conversion of natural communities (e.g., from chaparral to grassland). The historic fire frequency for any given site in the study area, varies substantially among land cover types, location, and topography (**Table 10-2**) (Davis and Borchert 2006; Stuart and Stephens 2006; Willis 2006). Due to the varying fire return intervals, return intervals are broadly defined for the fire-prone natural community types within the study area. Pre-historic, historic, and current fire return intervals for each natural community did not provide significant support for defining changed

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<sup>7</sup> Large catastrophic fires in the study area each burn 4 to 14% of the wildfire-prone land-cover types. These percentages were increased by 25% to take climate change into account. The increased percentages, 5% and 17%, were applied to the wildfire-prone land-cover types in the study area (298,016 acres) to determine the lower and upper limits of changed circumstances and the threshold at which circumstances would be considered unforeseen. 15% \* 14,901 acres = 2,235 acres. 15% \* 50,663 acres = 7,599 acres.



circumstances; rather the conceptual fire-return pattern classifications and expert opinion were used. For each natural community, remedial actions for changed circumstances will be applied up to the unforeseen threshold identified in **Table 10-2**. Remedial actions will be funded and carried out by the Implementing Entity when any number of fires, regardless of size, recur in the same area at intervals at or above the unforeseen circumstance thresholds identified in **Table 10-2**. Fire return intervals below the thresholds identified are considered unforeseen.

Fire potential in the study area is typically greatest in the months of June–September when dry vegetation co-occurs with low humidity. Generally, the vegetative communities within the Reserve System are adapted to a more frequent historic fire regime and would naturally recover from fire. Reserve unit management plans will include fire management and protection measures that will minimize the risk of damage to habitats and natural communities from abnormally frequent fire (normal fire frequency is described above). Preventative actions include those listed below.

- Create or redesign fuel breaks to limit fire spread.
- Consider the reintroduction of low-intensity prescribed fires to encourage fire-adapted plants and discourage non-fire-adapted invasive plants.
- Work with local fire agencies to improve fire-suppression preparedness and develop strategies to protect habitat during fire response.
- Incorporate public-awareness programs into reserve unit management plans. This includes public outreach to neighboring lands to minimize fire risk.

Should a wildfire take place, the Implementing Entity will follow protocols established in the reserve unit management plans and will work closely with local fire response crews to ensure that impacts on sensitive communities and covered species are minimized. This includes the identification and completion of appropriate post-fire restoration and rehabilitation responsibilities (see Chapter 5, Section 5.3.2 *Landscape Conservation and Management*). In addition, landscape-level monitoring will assess changes to land cover type, and natural community-level monitoring will assess the response of invasive plants as part of status and trends monitoring (see Chapter 7, Section 7.3.1 *Landscape-Level Actions*). In accordance with these conservation and monitoring actions, in the event of habitat loss, remedial measures shall take place to re-establish natural communities and covered plant populations lost to fire either to pre-fire conditions or as otherwise determined on a case-by-case basis.

Remedial measures apply to each of the episodes identified above. For example, if there was a grassland fire that burned 7,000 acres (meets the single event burned area criteria for changed circumstance) and a portion of the same area burned again in 15 years, remedial actions for both episodes would be funded. Remedial actions are listed below.

- Initiate a post-fire damage assessment within six months following the end of a fire in order to identify the appropriate post-fire restoration and rehabilitation actions.

- Initiate the appropriate actions, such as habitat restoration, invasive-species control and/or erosion control, in affected reserves to ensure the reestablishment of covered plants and other native vegetation through active or passive means, as appropriate, within one year post-fire.
- Implement measures through the Adaptive Management Program (see Chapter 7) in ways consistent with permit obligations and with the consent of the Implementing Entity.
- Ensure appropriate erosion control structures and applications (e.g., seeding) are in place prior to the next rainy season.

## Nonnative Species or Disease

Nonnative species and diseases currently occur in the study area and will be present in the Reserve System (e.g., bullfrogs, hybrid tiger salamanders). Additionally, there are nonnative species and diseases that exist in areas outside the study area that have the potential to spread into the study area and adversely affect the covered species and natural communities within the Reserve System. Due to the nature of invasive species and diseases, there is no unforeseen circumstance, only an upper limit to which changed circumstances will be funded. In other words, a new disease or invasive species spreading throughout the study area within the permit term is a foreseeable event. However, if a disease or nonnative species spread beyond the thresholds identified below, it would be considered a catastrophic event beyond the Plan scope and remedial actions to address it would not be required to be funded by the Implementing Entity.

The conservation strategy includes measures to reduce existing and prevent future infestations of nonnative invasive species and diseases (see Chapter 5, Section 5.3.2 *Landscape Conservation and Management*). The monitoring program will identify and map existing diseases and nonnative species in the Reserve System so that new ones can be identified quickly and a control or eradication plan can be put into place. However, it is possible that the following events could occur despite implementation of the conservation strategy and monitoring program.

- New and aggressive nonnative species could invade the Reserve System.
- Infestations of a new disease that affects covered or predominant species in the study area (e.g., Sudden Oak Death) could have dramatic effects on the Reserve System.
- Existing nonnative species or diseases could expand to unprecedented levels in the Reserve System, perhaps due to changing climate.

Under the Plan, the following are considered changed circumstances for which remedial measures will be funded.

- Infestations of new diseases or new nonnative invasive species affecting up to 25% of the extent (i.e., acres) of a predominant natural community (i.e.,

oak woodland) or occupied covered species habitat within the Reserve System in any given year<sup>8</sup>.

- Spread of nonnative species or diseases existing on up to 25% above current conditions within the Reserve System in any given year.

The Reserve System builds off of existing open space in the study area, targeting specific natural communities and species habitat across a range of environmental gradients in geographically distinct areas (i.e., Santa Cruz Mountains, valley floor, Diablo Range). Diseases and nonnative species could spread into the study area from lands adjacent to the study area. It is foreseeable that a single disease or invasive species would spread across the entire Reserve System even if the Habitat Plan and remedial measures are properly implemented. Such an event would be catastrophic and likely no effort by the Implementing Entity alone would be able to stop its spread. Therefore, if remedial measure implementation does not prevent the spread of the nonnative species or disease beyond the established thresholds, it would be considered a catastrophic event.

To ensure that remedial actions are implemented aggressively before the thresholds are reached, the Implementing Entity must demonstrate in writing to the Wildlife Agencies the following in order to justify cessation or reduction of remedial actions once the thresholds are crossed:

- The changed circumstance was detected as soon as feasible and the Wildlife Agencies were notified.
- The Implementing Entity coordinated and worked actively with the Wildlife Agencies and other land managers to assess the changed circumstance and determine the best course of action.
- The Implementing Entity implemented remedial measures for the changed circumstance according to the Plan but these measures failed to stop the spread of the disease or invasive species.
- The disease or invasive species is a serious problem outside the Reserve System in the study area and similar control measures implemented by others also failed to control their spread.

Based on current knowledge of likely diseases and nonnative species, disease spread at catastrophic levels is only reasonably likely in the study area for Sudden Oak Death. For other known diseases or nonnative species, the remedial measure thresholds are assumed to be sufficient.

Sudden Oak Death is not currently found in the study area; however it is found in adjacent Santa Cruz County<sup>9</sup>. This disease spreads rapidly and could spread into the Reserve System and affect more than 25% of the oak woodlands despite

<sup>8</sup> The Reserve System will be assembled for the majority of the permit term. All creation and restoration activities must be completed by Year 40 and all preservation must occur by Year 45. The Implementing Entity will monitor current levels of disease and nonnatives relative to the current composition of the Reserve System each monitoring year.

<sup>9</sup> In addition, Santa Clara County is a quarantine county for Sudden Oak Death under U.S. Department of Agriculture and California Department of Food Agriculture regulations.

implementation of the conservation strategy, adaptive management, and remedial measures. If this occurred, the spread of the disease would not be limited to the Reserve System and would affect the natural community at the landscape scale. If Sudden Oak Death spread beyond 25% it would be considered a catastrophic event. In contrast, in the case of bullfrogs, an existing nonnative species, it is not reasonably foreseeable that the species would spread to an additional 25% of aquatic communities (from baseline levels) in the Reserve System. Bullfrogs are expected to be controlled in the Reserve System through proper implementation of the conservation strategy and adaptive management program (which includes a major component of bullfrog eradication and control) and proper implementation of remedial measures, if needed. The spread of diseases or invasive species in excess of 25% above baseline conditions is foreseeable for Sudden Oak Death and may be foreseeable for other diseases not currently known. However, because these events are considered catastrophic, the Implementing Entity would only fund remedial actions for these circumstances up to the 25% thresholds identified above (for Sudden Oak Death or other diseases or invasive species).

There are a number of diseases and nonnative species that may harm covered species and the natural communities on which they depend. Diseases that may threaten covered species in the study area include chytrid fungus, which could affect foothill yellow-legged frog, California red-legged frog, and California tiger salamander (U.S. Fish and Wildlife Service 2002; 69 Federal Register 48570–48649), and possibly rana viruses, which could affect California tiger salamander (69 Federal Register 48570–48649). It is unknown whether these diseases are a problem for populations in the study area due to a lack of surveys. In general, the effects of diseases on the survival and reproduction of covered species is poorly known. The method of measurement of the extent of new diseases will be different for each disease (e.g., number of trees affected, proportion of species' range, number of populations).

Diseases that may affect or threaten natural communities include Sudden Oak Death. Although not currently in the study area, Sudden Oak Death has been confirmed in San Mateo, Santa Cruz, Alameda, and Contra Costa Counties, and portions of Santa Clara County outside the study area; consequently, there is a high likelihood for it to spread into the study area during the permit term. Spread of this disease in the study area could lead to change in species composition, type conversion, and an increased risk of fire due to standing dead trees.

The list of nonnative plants and animals is much more extensive. They include but are not limited to invasive mussels, bullfrogs, nonnative pigs, and introduced predatory fish. These species currently occur in the study area, and conservation and monitoring actions to reduce or contain their occurrence within the study area have been developed.

When a new disease or nonnative species is detected or an existing disease or nonnative species begins to spread aggressively, the Implementing Entity will contact the Wildlife Agencies to collaboratively determine the best method of measuring, monitoring, and eradicating or controlling the disease before it

spreads<sup>10</sup>. Remedial measures that address the invasion of nonnative species or disease follow the steps listed below.

- Determine the best method for measurement and tracking extent within 3 months of detection.
- Prepare a damage-assessment report within 6 months of detection.
- Recommend and plan actions to address the threat within 6 months of detection.
- Respond through adaptive management in ways consistent with permit obligations and with the consent of the Wildlife Agencies within one year of detection.

## Flooding

Flooding is a natural event in stream systems, having both beneficial and detrimental effects on natural communities. Beneficial effects include limited scouring and thinning of homogeneous stands of riparian vegetation. However, detrimental effects of floods along stream channels with new riparian plantings could include destruction of enhanced or restored sites and created covered plant populations. This would require substantial remediation.

Major floods are defined as flood events that exceed the stream's capacity (i.e., 10-year flood event). Several major floods have been documented since European settlement in Santa Clara County, most recently in 1967, 1978, 1980, 1982, 1983, 1986, 1995, 1996–1997, and 1998. Flooding probability is specific to each stream's capacity, the runoff potential of the stream's upper catchment, and rainfall patterns across the county. Given that urbanization has increased across the county (increasing flood potential) and that local agencies have completed and continue to develop flood control projects to accommodate increased peak runoff (decreasing flood potential), past flood events do not reliably predict future flood probability.

In most cases several major floods occur within a given year in multiple watersheds. For example, a particularly wet year allows for increase rainfall throughout the County. Extended periods of high rainfall cause soil saturation. Factors such as stream capacity and runoff potential also increase the likelihood of flooding throughout the study area increases. This allows for multiple events to occur in a given year.

Taking into account climate change, we must rely on predictive models in addition to historic trends. Climate change models typically focus on the occurrence of 100-year flood events. While there is a discrepancy over whether precipitation will increase or decrease in the study area, it is expected that storms

<sup>10</sup> A recent example of such a situation was the discovery in 2000 of barbed goat grass on Coyote Ridge, a highly invasive plant not previously known in that area. Local biologists and land managers coordinated with the Wildlife Agencies on appropriate rapid responses to the threat. After trying several techniques and applying the most effective techniques over multiple years, by 2008 the infestations were nearly eradicated (S. Weiss pers. comm.).

at or below the 100-year event are reasonably likely within the permit term and could potentially increase in frequency in the county due to climate change (Hayhoe et al. 2004; Kim 2005; California Natural Resources Agency 2009). The 100-year flood (i.e., one-percent flood) is defined as the flood event that has a 1% probability of occurrence in any given year. Over a very long period of time, it is the flood event that would, on average, occur once per hundred years; however, over a short time span, it can occur more than once in a single year or not at all for several hundred years. For example, a one-year storm event has a 100%, approximately, probability of recurring each year. This does not mean that a 1-year event will happen every year; however it is highly likely to happen each year. A 100-year storm event has a 1% probability of recurring each year.

The 100-year flood event for an individual creek or reach of creek is expressed as a “Q” or flow rate. The “Q” can be modeled, and/or estimated by using a variety of data sets. The estimated “Q” or flow rate for a given storm event (i.e., 1-year, 10-year, 50-year, 100-year) will be as accurate as the data set you are using to estimate it. While the 100-year flow rates are available for the streams in the Plan Area, they are not a good indicator of flood event intensity and frequency for assessing changed circumstances.

Climate change models also demonstrate clear trends towards earlier snowmelt accompanied by increased frequency of winter flooding (Dettinger et al. 2004). These climate-change predictions are most likely to impact the study area later in the permit term, if at all, as the models predict more drastic hydrologic changes for the end of the century compared to mid-century. The flood-control standard for local agencies is the 100-year event. As such, these climate change driven hydrologic changes, along with changes from increased urbanization, are being taken into account by the SCWVD in flood control project design. Consequentially, climate change is not anticipated to have an effect on flood event intensity and frequency.

Major flood events could occur in the study area during the permit term and are therefore considered changed circumstances. Historically, most major flood damage occurred on the valley floor, away from almost all of the areas anticipated to be incorporated into the Reserve System, which will be located mostly in the lower to middle elevations. Portions of the Reserve System most susceptible to flooding would occur in lower elevations. The dams in these watersheds do not play a significant role in flood control (i.e., Pacheco Dam). Flooding may also be possible in the Reserve System in lower reaches of Uvas or Llagas Creek. Regardless of location, remedial measures will be implemented for all flood events that damage or destroy enhancement projects, restoration projects, creation projects, or in-stream conservation structures, so that success criteria can be met and compliance credit maintained. Thresholds for flood events that are not reasonably foreseeable have not been established for determining unforeseen circumstances.

Following a flood event, the site will be evaluated to determine appropriate corrective actions necessary to restore the habitat through active management or natural processes. Remedial actions (i.e., grading, new riparian plantings, debris

removal, covered plant restoration, etc.) will be implemented within a time period to maintain permit compliance with the Stay-Ahead provision for restoration, creation, and enhancement (see Chapter 8). Measures shall be implemented through the adaptive management program (see Chapter 7). The Implementing Entity will have the option of implementing remedial actions on site or in-kind. For example, if the cost to rebuild an enhancement, restoration or creation project exceeds the cost of constructing a new project, the Implementing Entity will have the option of constructing a new project elsewhere within the Reserve System of equivalent or greater biological value.

## Drought

Drought is a natural part of a Mediterranean climate system to which species and natural communities have adapted. However, a prolonged drought could cause serious damage to the Reserve System, especially to new restoration plantings and enhanced or created populations of covered plants that have yet to become established. The following analysis was conducted to define droughts and estimate their expected frequency of occurrence in the study area. Droughts that occur within this expected frequency are considered a changed circumstance and are expected and funded over the course of Plan implementation; droughts outside this frequency are considered unforeseen.

To estimate how many drought years might be expected during the permit term, annual natural reservoir inflow (i.e., inflow from local precipitation, not imported water) within the study area was reviewed from 2010 back to 1925 by water year (July 1 to June 30). A drought is defined as two or more successive water years with 75% or less of the median inflow. These data show that droughts lasting 2 to 6 years occurred 4.2 times over any 50-year period. Of these droughts, only a single event lasted 6 years. A predictive study determined that droughts of 6 years are expected to occur two to three times in 100 years based on historic information (Dean et al. 1994). It is assumed that a drought of three or more years in length has an approximately 60% chance of occurring. While climate change is anticipated to result in increased drought potential, the extent of such change is not fully understood. Thus, the predicted drought potential during the permit term is conservative.

Based on historic data and conservative application of climate change predictions, remedial actions will be funded by the Plan for up to seven droughts, each one to eight years in duration, occurring during the permit term. Of the seven droughts, only one is anticipated to be eight years in duration. More than seven droughts during the permit term, more than a single drought of eight years, and any number of droughts exceeding eight years in duration each are considered unforeseen circumstances and not funded by the Plan.

The monitoring and adaptive management program includes monitoring of enhancement, restoration and creation sites. This will minimize the risk of losing mitigation plantings and restored habitats due to drought. Preventative measures will be included in the monitoring program (Chapter 7, Section 7.3.2 *Natural Community-Level Actions*) and are listed below.

- Monitor SCVWD natural reservoir inflow data in the study area to determine if the seasonal inflow at the end of April indicates a dry year (near 75% of inflow).
- Monitor mitigation sites that are beyond their establishment periods (i.e., no longer sustained by irrigation) but that have not achieved their success criteria for stress due to low soil moisture or high evapotranspiration rates.
- Extend preventative measures (e.g., longer-term supplemental irrigation) as necessary for enhancement, restoration, or creation projects that have not achieved their success criteria to prevent damage or losses due to drought and to assure success rates of the projects.

Should damage or losses due to drought occur, the Implementing Entity will assess the drought damage and initiate the following remedial measures within one year of damage or loss.

- Prepare damage assessment report.
- Identify actions to improve effects on covered species (e.g., provision of temporary artificial water sources).
- Identify actions to improve effects on enhanced, restored, or created habitats that have not achieved their success criteria (e.g., supplemental irrigation).
- Implement measures through the Adaptive Management Program (see Chapter 7) in ways consistent with permit obligations and with the consent of the Implementing Entity.

## Earthquakes

Earthquakes of less than 4.0 on the Richter scale (defined as “micro” or “minor” earthquakes by the USGS) occur frequently in the study area and their effects on natural communities and covered species are expected to be very small or undetectable. While less common, earthquakes defined as “light” (magnitude 4.0 to 4.9) or “moderate” (5.0 to 5.9) are expected to have little to no effect on covered species or natural communities<sup>11</sup>. However, these earthquakes may be large enough to cause moderate ground shaking which may trigger small to moderate-sized landslides. These landslides are a natural part of the ecosystems in the study area. Damage to Reserve System facilities from such light to moderate earthquakes is expected to be low to none.

A large, catastrophic earthquake is typically defined in planning documents and engineering projects as having a magnitude equal to or greater than 6.7<sup>12</sup>. This magnitude earthquake has the potential to occur during the permit term in or near the study area. The USGS predicts that an earthquake of magnitude 6.7 or greater has a 7% chance of occurring by 2036 on the Calaveras Fault, which extends down the eastern side of the study area in the foothills of the Diablo

<sup>11</sup> Earthquakes of magnitude 6.0 to 6.6 are not specifically defined by the USGS.

<sup>12</sup> Source: <<http://earthquake.usgs.gov/regional/nca/wg02/index.php>>. For reference, the Northridge earthquake of 1994 was a magnitude 6.7.



Range<sup>13</sup>. The Hayward Fault to the north of the study area has a 31% chance of an earthquake of this magnitude by 2036. The San Andreas Fault, which runs down the western side of the study area through the Santa Cruz Mountains, has a 21% chance of a similar event. Earthquakes of every magnitude described above could occur in or near the study area during the permit term and are therefore considered changed circumstances.

The negative effects of a catastrophic earthquake are likely to manifest mostly as damage to infrastructure (i.e., fencing, bridges, buildings, temporary irrigation) rather than to natural communities or species. Should any earthquake occur, the Implementing Entity will rebuild Reserve System infrastructure and conduct *post hoc* monitoring of species or populations that are identified as being potentially negatively affected by the incident. Reserve System infrastructure will be repaired or rebuilt within two years. Remediation of enhancement, creation, and restoration sites within the Reserve System affected by earthquakes during the permit term (i.e., as a result of landslides) would be remediated within two years of the earthquake. Site-specific covered species and natural community monitoring will be conducted for three years after the event if covered species or their habitats are adversely affected.

Damage to Reserve System infrastructure, natural communities, and covered species from any earthquake will be remediated by the Implementing Entity.

## 10.2.2 Federal No Surprises

The federal *No Surprises Regulation* was established by the Secretary of the Interior on March 25, 1998. It provides assurances to Section 10 permit holders that no additional money, commitments, or restrictions of land or water will be required should unforeseen circumstances requiring additional mitigation arise once the permit is in place. The No Surprises Regulation states that if a Permittee is properly implementing an HCP that has been approved by USFWS and/or NMFS, no additional commitment of resources, beyond that already specified in the plan, will be required.

The Permittees request regulatory assurances (No Surprises) for all covered species in the Plan. In accordance with No Surprises, the Permittees will be responsible for implementing and funding remedial measures in response to any changed circumstances as described in this chapter. The Permittees will not be obligated to address unforeseen circumstances but will work with the Wildlife Agencies to address them within the funding and other constraints of the Plan should they occur.

The Permittees understand that No Surprises assurances are contingent on the proper implementation of the permits, Implementation Agreement, and Habitat Plan. The Permittees also understand that USFWS may suspend or revoke the federal permit, in whole or in part, in accordance with federal regulations

<sup>13</sup> Source: <<http://earthquake.usgs.gov/regional/nca/ucerf/>>. The Calaveras Fault runs immediately east of Coyote Ridge in a line traced by the locations of Anderson, Coyote, and Calaveras Reservoirs.

(50 CFR Section 13.27 and 13.28 and other applicable laws and regulations) in force at the time of such suspension.

### 10.2.3 Federal Section 7 Consultations

An important goal of the Plan is to provide a framework for ESA compliance for covered species for all covered activities in the study area. Whether a covered activity occurs under Section 7 or 10 of the ESA, the Habitat Plan will provide the framework for future Section 7 consultations. For some future projects, ESA consultation (through Section 7) will still be required even after the Plan is complete (e.g., SCVWD flood control projects or private development projects that require a Corps wetlands permit). As such, the consultation process must be taken into account when developing a project timeline.

Projects that are subject to Section 7 of the ESA are evaluated under different standards than projects subject to Section 10. Non-federal projects must obtain a permit for take of listed species, while federal agencies must consult with USFWS or NMFS whenever their actions have the potential to affect a listed species. For example, the definition of “affect” differs slightly from that of “take” and may be applied differently, depending on the species and the project.

The Habitat Plan is not intended to alter the obligation of another federal agency to consult USFWS or NMFS pursuant to Section 7 of the ESA. Unless otherwise required by law or regulation, USFWS will ensure that biological opinions issued for projects that are defined as covered activities under the Habitat Plan are consistent with the biological opinion issued for the Habitat Plan and the federal permit. Section 7 consultations only apply to federally listed species, so only those covered species that are federally listed at the time of the consultation need be included in the consultation. Unless otherwise required by law or regulation, USFWS will not impose measures on applicants for coverage under the Habitat Plan in excess of those that have been or will be required by the Implementing Agreement, the Habitat Plan, and the permits. Before completing a Section 7 consultation for a covered activity in which USFWS proposes to require a measure in excess of the requirements of the Implementing Agreement, the Habitat Plan, or the permits, USFWS will meet and confer with the Permittee with jurisdiction over the affected project to discuss alternatives to the imposition of the measures that would meet the applicable legal or regulatory requirements. No Surprises assurances cannot be provided to federal agencies through the Section 7 process (50 CFR Section 17.22(b)(5)). USFWS will process subsequent ESA consultations for covered activities in accordance with the established regulatory process and deadlines (50 CFR Section 402.14).

### 10.2.4 State NCCP Assurances

The NCCP Act (Section 2820[f]) includes provisions ensuring that “if there are unforeseen circumstances, additional land, water, or financial compensation or restrictions on the use of land, water, or other natural resources shall not be

required without the consent of the plan participants...” The NCCPA specifies that assurances for plan participants may be provided commensurate with long-term conservation assurances and associated implementation measures provided in the Habitat Plan. CDFG’s determination of the level of assurances and the time limits specified in the Implementing Agreement will be based on the overall knowledge of the species and natural communities, the strength of the conservation strategy, and the size and duration of the Habitat Plan (Sections 2820[f][1][A–H]).

The Permittees understand that No Surprises assurances are contingent on full implementation of the Habitat Plan. The Permittees also understand that CDFG may suspend the state permit, in whole or in part, in the event of any material violation of the state permit or material breach of the Implementing Agreement by the Permittees. See the Implementing Agreement Section 16 for additional information on permit suspension including steps that must be followed prior to permit suspension.

## **10.2.5 Conservation Contributions by State and Federal Agencies**

It is anticipated that state and federal agencies, including the Wildlife Agencies, will contribute to the conservation portion of the Plan. The Permittees recognize that state and federal funds cannot be guaranteed in advance of the approval of yearly budgets, nor can they be guaranteed by agency staff who do not have the authority to commit these funds. However, the Permittees seek assurance that the Wildlife Agencies will make every effort to assist the Implementing Entity in securing the funding outlined in Chapter 9 to contribute to species recovery and to help implement the conservation portion of the Habitat Plan.

## **10.2.6 Staff Contributions by State and Federal Agencies**

Successful implementation of the Habitat Plan relies on the continued participation and feedback of representatives of the Wildlife Agencies. As described in Chapter 8, Wildlife Agency staff are expected to participate in Implementing Entity meetings and subcommittees as needed to evaluate and provide advice and applicable consent on Plan implementation. In particular, Wildlife Agency staff participation is critical to the success of the adaptive management and monitoring program. The Permittees request that the Wildlife Agencies make every effort, given budget and workload constraints, to provide staff to serve on all appropriate committees and participate in discussions and meetings to ensure that the implementation of the Habitat Plan is consistent with any findings upon which the permits are based.

## 10.2.7 Assurances for Private Landowners

### Take Authorization Assurances

Project proponents will receive take authorization for covered activities according to the procedures and requirements described in the Plan (see Chapter 6, Section 6.3 *Conditions on All Covered Activities* and Chapter 8, Section 8.7 *Roles and Responsibilities in Reviewing Applications for Take Authorization*). Take authorization is granted under a single non-severable permit. If the USFWS or CDFG suspend or revoke their permit, take authorization provided to those under the jurisdiction of the Permittees would also be suspended or revoked. As such, for projects conducted by private developers under the jurisdiction of one of the Permittees, take authorization will remain in effect for that covered activity unless one or more of the permits issued by the Wildlife Agencies to the Permittees are suspended or revoked. In addition, if a local jurisdiction determines that one of its project proponents is in violation of their permit (i.e., in violation of the conditions in Chapter 6), the local jurisdiction will suspend or revoke take coverage extended to the project proponent and report the violation to the Implementing Entity. The Implementing Entity will report the violation to the Wildlife Agencies immediately.

### Neighboring Landowner Assurances

This Habitat Plan calls for the acquisition of land and coordinated management of a Reserve System for the benefit of covered species. As a result of the conservation strategy (Chapter 5), some populations of listed species are expected to increase in the reserves and elsewhere. Landowners adjacent to or near reserves may be concerned that populations of state- or federally listed species in the reserves may expand and colonize or use their lands, potentially restricting their land use activities. The Neighboring Landowner assurances included in this Plan are designed to address these concerns.

Active private ranches, cropland, pasture, orchards, and vineyards are the most abundant land uses in Santa Clara County outside of the urban centers. These are the land uses that are also most likely to occur adjacent to reserve lands. Land uses outside urban areas that are most likely to be affected by the presence or increased abundance of covered species are limited to actively farmed lands such as crops, pasture, orchards, or vineyards in which heavy equipment is used regularly and the soil is regularly disturbed. Routine ranching activities (e.g., livestock grazing on annual grassland) are not expected to be affected by the maintenance or increase of populations of covered species on nearby reserve lands. Most routine ranching activities have little or no adverse impact on the terrestrial covered species and in some cases may benefit them<sup>14</sup>. Other land uses (e.g., urban development) are excluded from Neighboring Landowner protections

<sup>14</sup> Special federal rules (called “4(d) rules”) exempt defined routine ranching activities from take prohibitions of California red-legged frog and California tiger salamander.

because ongoing take of covered species is not expected to occur within these areas.

Neighboring Landowner Assurances are extended to certain “farmlands” as defined below. For purposes of the Neighboring Landowner Agreement program, *farmlands* means lands on which normal agricultural practices including but not limited to crop planting and production, irrigation and fertilization, soil tilling, crop harvesting, grazing including intensive livestock grazing, forage production, animal production and husbandry, and other associated activities such as fence construction and maintenance, vehicle or horse use, and construction and maintenance of typical farm outbuildings.

Take coverage for this program is limited to three covered species: California red-legged frog, California tiger salamander, and western pond turtle. By providing Neighboring Landowner Assurances, the Habitat Plan acknowledges that successful implementation of the conservation strategy (e.g., specific management actions that benefit species) may cause the three species listed above to become established on or use nearby private lands. Take coverage afforded by Neighboring Landowner Assurances could result in a diminution of the benefits of the conservation strategy for these three species in instances where species expand or increase their populations within the study area. Neighboring Landowner Assurances do not provide for take of existing populations at the time baseline conditions are documented. Accordingly, this program would not reduce these populations or habitat from baseline conditions. In addition, these assurances end when the permit term expires.

Neighboring Landowner Assurances provide incidental take coverage for California red-legged frog, California tiger salamander, and western pond turtle on all private farmlands, within 1.0 mile of the boundary of any land or property acquired or placed under easement by the Implementing Entity or by another organization in partnership with the Implementing Entity for the Reserve System. A one mile buffer was determined to account for the most likely dispersal distances of California tiger salamander and California red-legged frog (e.g., dispersal distance of from breeding habitat into upland habitat). Covered species are expected to disperse or move more than 1.0 mile but this radius accounts for the most likely area of effect into neighboring lands.

Once land acquisition is complete (by Year 45 of the Plan), the lands eligible for these assurances are estimated at 20,395 acres (4% of the study area) if all lands currently in agricultural use remain in agricultural use. The impact analysis assumes that total of 8,018 acres of cultivated agricultural land in the study area will be removed by covered activities (**Table 4-2**). Applying this assumption reduces the estimated eligible land to 12,377 acres (2% of the study area) by the end of the permit term. Because the actual pattern of agricultural land conversion is difficult to predict, these two values represent a likely range of eligible land (rounded to 12,400 acres to 20,400 acres). Modeled habitat for the three species is found on these sites, but mostly for secondary or dispersal habitat, not breeding habitat (**Table 10-3**). Modeled habitat for the three species also overlap with each other.

Privately held lands will be included in this Neighboring Landowner Assurances program through a voluntary application process. The neighboring landowner would apply to the Implementing Entity for coverage and the Implementing Entity would determine whether the lands in question qualified and, if they did, issue a *Certificate of Inclusion* for the property that will be signed by the landowner. The approach is required by the Wildlife Agencies to allow an affirmative statement be made by willing landowners to participate in the Habitat Plan. Those landowners that do not seek to participate will not be required to do so but will also not receive coverage for incidental take for their ongoing activities as a result of Habitat Plan conservation actions. Neighboring land agreements can only extend take coverage to eligible parcels or portions of parcels<sup>15</sup> within the permit area (i.e., not adjacent counties or portions of Santa Clara County that are outside of the permit area). Based on the landowner participation in other counties with approved HCPs that have similar programs (e.g., San Joaquin County), it is assumed that up to 10% of eligible lands will enter into neighboring land agreements, or no more than 1,240 to 2,040 acres.

The neighboring landowner protections listed below will be offered under the Plan according to the definitions and process defined below.

- Farmlands (as defined above) within 1.0 mile of reserve boundaries may be covered for incidental take of California red-legged frog, California tiger salamander, and western pond turtle authorized for take under the Habitat Plan's associated Section 10(a)(1)(B) and NCCP permits, should any such lands support increased use or become inhabited by these three covered species *after* establishment of a reserve parcel within 1.0 mile. Take coverage will not be provided for individuals or populations of these three covered species that inhabit the neighboring lands prior to the establishment of a reserve parcel, as identified in a baseline survey (see below).
- Coverage under the take permits will be offered to neighboring lands actively being used for farming purposes at the time that the reserve is established within 1.0 mile.
- *Actively being used for* means lands on which usual and customary agricultural practices are occurring, including normal crop rotation practices, at the time the neighboring reserve is established. For example, if agricultural lands that are used for crop production lie fallow in accordance with normal crop-rotation practices at the time the neighboring reserve is established, those lands would be considered to be actively used for farming purposes. Such coverage shall continue, subject to the terms and conditions of the Habitat Plan, the Implementing Agreement, and the take permits, for as long as the neighboring lands are actively being used for farming purposes and the permits remain in effect.
- Coverage will not be offered to neighboring lands devoted to non-farmland purposes at the time the nearby reserve is established. Take coverage does not include conversion of agriculture to other uses.

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<sup>15</sup> Landowners with parcels that lie partly within the permit area or partly within the 1.0 mile eligible radius may enroll only that eligible portion of their parcel in the Neighboring Landowner Assurances program.

- A change in agricultural land cover as defined by the land cover types in this Habitat Plan (e.g., pasture to vineyard) would require landowners reapplying to the Implementing Entity for Neighboring Landowner Assurances in order to determine the new baseline condition of covered species on the affected property.
- Prior to receiving coverage under the permits, the environmental baseline must be determined. The baseline conditions on a site will be documented to define the type, number, location, and condition of California red-legged frog, California tiger salamander, and western pond turtle or their habitat present on the site prior to the acquisition or management of reserve lands within 1.0 mile of the site. The final baseline report will document the areas and resources of the neighboring parcel eligible for take authorization under this program. Landowners will have the option of either allowing biologists with the Implementing Entity to survey their property and reimbursing these costs, or hiring a biologist on their own that is approved by the Implementing Entity to do so. Survey costs associated with participation in this program are the responsibility of the landowner. Reports prepared by landowner consultants will be reviewed by the Implementing Entity for adequacy. Neighboring Landowner Assurances do not provide for take of existing populations and already occupied habitat of listed species (i.e., the baseline conditions). Accordingly, this program would not provide coverage for a decline in baseline conditions.
- The survey report will address the areas proposed for Neighboring Landowner protections and will include, at a minimum, a description of habitat for covered species (extent and quality), existing records of covered species within 1 mile of the parcel proposed for coverage, and the results of surveys for covered species on the parcel proposed for coverage. Upon receipt of a biological report approved by the Implementing Entity and a *Certificate of Inclusion* signed by the landowner, the Implementing Entity will grant take coverage to the landowner under this program.
- A change in ownership of land enrolled in the Neighboring Landowner Assurances program requires the new landowner to notify the Implementing Entity in order to continue coverage. This notification allows the Implementing Entity to verify that the new landowner wishes to continue to be enrolled in the program. No new surveys are required to continue coverage under the program, if agricultural land cover documented in the original Neighboring Landowner Agreement is maintained by the new owner. However, the new land owner would have to sign a Certificate of Inclusion for the property.

The Implementing Entity will maintain a record of all correspondence and certificates of inclusion sent to neighboring landowners subject to these protections, as well as signed certificates of inclusion returned by landowners. The Implementing Entity will notify the Wildlife Agencies of the number, location, and size of neighboring lands entered into the program in its annual report. Copies of the certificates will be provided to the Wildlife Agencies upon request. The location of all neighboring lands enrolled in the program will be mapped in the Implementing Entity's GIS database.

As the Reserve System grows, the Implementing Entity will include an outreach component to educate neighbors on how to continue their agricultural practices to minimize effects to species (and to benefit species) and inform land owners about the Neighboring Landowner Assurances program and provide ongoing education for those enrolled in the program.

## **Public Access to Conservation Easements Held by Private Landowners**

It is not the intent of the Implementing Entity to allow general public access on conservation easements that are part of the Habitat Plan Reserve System. Public access to private lands managed under the Habitat Plan could conflict with ongoing agricultural or other operations and could pose a safety risk to the public. Public access to lands under conservation easements could also pose a risk of unwanted trespass onto adjacent privately held lands. Generally, the Implementing Entity will leave decisions regarding public access up to the landowner but will restrict access through the conservation easement where that access may conflict with the conservation goals of the site (see Chapter 8, Section 8.6.3 *Conservation Easements*). All conservation easements will provide access for the Wildlife Agencies' and Implementing Entity's biologists to conduct management and biological monitoring necessary for compliance with the Habitat Plan's adaptive management and biological monitoring program.

## **10.3 Modifications to the Plan**

The Habitat Plan or incidental take permits can be modified in accordance with USFWS and CDFG regulations and the terms of the Implementing Agreement. Habitat Plan modifications are not anticipated on a regular basis. Modifications can be requested by a Permittee or by the permitting agencies. The categories of modification that are recognized, in order of significance, are administrative changes, minor modifications, and amendments, each of which is described below.

### **10.3.1 Administrative Changes**

Administrative changes are internal changes or corrections to the Plan that do not require preauthorization from the Wildlife Agencies. Administrative changes do not result in any changes to the impacts analysis, conservation strategy, or decision documents. Administrative changes will be made in writing and documented by the Implementing Entity. The Wildlife Agencies will be provided a summary of administrative changes in each annual report. Examples of administrative changes are listed below.

- Corrections of errors in the Plan that do not change the intended meaning or obligations.



- Day-to-day implementation decisions, such as modifying irrigation schedules for created/restored habitats on the basis of observed water needs of planted vegetation.
- Conducting additional monitoring surveys.
- Modifying Habitat Plan monitoring protocols to align with Wildlife Agency monitoring protocols as they may be modified in the future.
- Adopting new monitoring protocols that may be promulgated by the Wildlife Agencies in the future.
- Annual adjustments to the Habitat Plan development fee and wetland fees to keep pace with the inflation of land values.
- Changes to the membership of the Governing Board, Implementation Board, the Science Advisors, or any advisory committees to the Board without changing the representation of the Permittees, agencies, or organizations.

### 10.3.2 Minor Modification

Minor modifications to the Plan are changes that do not adversely affect the impact assessment or conservation strategy described in the Habitat Plan and do not adversely affect the ability of the Implementing Entity to achieve the conservation strategy commitments of the Habitat Plan. Minor modifications do not require an amendment to the permits or the Implementing Agreement, but they do require pre-approval by the Wildlife Agencies before being implemented. In addition, minor modifications do not change the scope or nature of the covered activities and do not trigger a new NEPA analysis. Examples of minor modifications are listed below.

- Updates to the land cover map or to species occurrence data that are consistent with the predictions and expectations of the Habitat Plan.
- Modifying the design of directed studies or implementing new studies.
- Minor changes to the biological goals or objectives in response to adaptive management.
- Minor changes to survey or monitoring protocols that are not proposed in response to adaptive management<sup>16</sup>.
- Modification of monitoring protocols for Habitat Plan effectiveness not in response to changes in standardized monitoring protocols from the Wildlife Agencies.
- Modification of existing or adoption of additional conservation measures that improve the likelihood of achieving covered species objectives.

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<sup>16</sup> Such changes are subject to federal No Surprises regulations, state assurances, and local assurance provisions found in the Implementing Agreement.

- Discontinuation of ineffective conservation measures and adoption of new conservation measures that improve the likelihood of achieving the conservation strategy.
- Modification of existing or adoption of new performance indicators or standards if results of monitoring and research or new information, indicate that the initial performance indicators or standards need revision.
- Modification of existing or adoption of additional covered species or natural community objectives where such changes more effectively achieve covered species, natural community, and overall Habitat Plan goals.
- Modification of the conditions on covered activities in response to adaptive management.
- A minor change to the conservation strategy restoration/creation interim deadlines (**Table 5-14**) (e.g., extend a deadline by up to 2 years, if compliance has almost been accomplished and can be documented by the Implementing Entity).
- Minor changes to the reporting protocol.
- Other changes that do not result in adverse effects on covered species beyond those analyzed in the Habitat Plan and the associated biological opinion, and do not limit the ability of the Implementing Entity to achieve the biological goals and objectives of the Plan.

Changes in the land acquisition configuration of the Plan (see Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Actions*) may be necessary to address changing land use patterns, such as rural development, in the study area or a lack of willing sellers in key Conservation Analysis Zones (Zone). Changes in land acquisition requirements within a Zone that amount to less than 5% of the original acreage are considered minor modifications as long as all three of the conditions listed below are met.

- The overall target acquisition acreage of land cover type or habitat for covered species does not change within the study area (i.e., a decrease in land acquisition on one Zone is balanced by an increase in land acquisition in another Zone).
- The changes between Zones are biologically equivalent or biologically superior to the original Plan.
- The changes do not affect the ability of the Implementing Entity to mitigate the impacts on covered species, contribute to the recovery of covered species, and meet the Plan's biological goals and objectives.

These are considered minor adjustments to account for willing sellers whose parcels span more than one Zone and may shift land cover between Zones while still meeting overall land cover requirements. A minor change in land acquisition configuration may be needed, for example, to account for small differences in acreages of land cover type across Zones due to parcel boundary changes or spanning across multiple Zones. In addition, this allowance is also important to account for limitations in the land cover mapping where a parcel

may contain important biological resources that were missed in the mapping but identified in the field. Finally, rural development occurring in one Zone may limit the acquisition opportunities of land cover types with limited occurrences within the Zone. This may make the same land cover type in an adjacent Zone a more attractive acquisition option. Any change in land acquisition requirements that exceeds 5% of the original acreage requirement or that is inconsistent with the criteria above is considered an amendment.

A change in the Habitat Plan study area (either a decrease or an increase) in response to a change in the planning limit of urban growth or city limit is also considered a minor modification, as long as the change meets the five conditions listed below.

- There is no change in the permit area.
- It is compatible with the conservation goals and Reserve System configuration of the Plan.
- It is consistent with the urban development covered activities in the Plan as defined in Chapter 2.
- It is consistent with the impact analysis of the Plan (Chapter 4).
- It addresses activities that are already covered by the Plan.

## **Minor Modification Process for Section 10(a)(1)(B) Permit**

Minor modifications to the federal permit may be proposed by one or more Permittees, the Implementing Entity, or the USFWS. While the USFWS does not have the right to amend its own permit unilaterally, they may propose minor modifications to the Permittees for consideration. Minor modifications shall take the form of a proposal that includes the following elements:

- Description of proposed minor modification.
- Rationale for proposed minor modification.
- Analysis of the environmental effects of the proposed minor modification, including impacts to covered species and implications for the conservation strategy.
- Description and declaration of how the proposed minor modification conforms to the conditions disclosed above (i.e., compatible with conservation goals) and the terms of the Plan as it was originally adopted.

All minor modifications must first be approved by the Implementing Entity Governing Board in a public meeting, and are subject to final approval by the Wildlife Agencies. To modify the Plan without amending the permits, the Implementing Entity Governing Board will submit to the Wildlife Agencies a written description of the proposed change and an explanation of why its effects are not believed to be significantly different from those described in the original Plan.

Upon receiving the proposal for a minor modification, the Wildlife Agencies may authorize the modification, request additional information, or deny the modification. If the Wildlife Agencies concur with the proposal, they will authorize the modification in writing, and the modification shall be considered effective on the date of the Wildlife Agencies' written authorization. If the Wildlife Agencies feel that the proposal lacks specific information, the Wildlife agencies may request additional information in order to authorize or deny the modification. If the Wildlife Agencies deny the modification, they will provide explanation for the denial.

The Wildlife Agencies will not approve minor modifications to the Plan if they determine that the modifications would result in adverse effects on covered species or natural communities that are significantly different from those analyzed in the Plan. If any Wildlife Agency denies a proposed modification, it may be proposed as an amendment as described below.

## **Minor Modification Process for NCCP Act Permit**

There is no established procedure to amend an NCCP Act permit through a minor modification. However, the minor modification process described above for the federal permit is proposed to also apply to the NCCP Act permit. The Implementing Entity will submit the same proposal to CDFG as to USFWS. CDFG will review the proposal and choose to accept the proposal, request additional information, deny the proposal, or require that the modification be processed as an amendment, as described below.

### **10.3.3 Amendments**

An amendment is a change in the Plan that may affect the impact analysis or conservation strategy in the Plan. Amendments to the Habitat Plan and the incidental take permits follow the same formal review process as the original Plan and permits, including NEPA/CEQA review, Federal Register notices, an internal Section 7 consultation with USFWS, and formal NCCP findings by CDFG. An internal Section 7 consultation with NMFS would be required if anadromous fish are added to the Plan. The Implementing Entity's Implementing Board will submit a proposed amendment to the Wildlife Agencies in a report that includes a description of the need for the amendment, an assessment of its impacts, and any alternatives by which the objectives of the proposal might be achieved.

Examples of changes that would require an amendment include but are not limited to those listed below.

- Revisions of the permit area boundary.
- Addition of species to the covered species list.

- Increasing the allowable take limit of existing covered activities or adding new covered activities to the Plan.
- Modifications of any important action or component of the conservation strategy under the Habitat Plan, including funding, that may substantially affect levels of authorized take, effects of the covered activities, or the nature or scope of the conservation program. This includes a reduction in the conservation strategy in the event that covered activities and fee funding do not occur as expected (see below for additional explanation).
- A major change to a conservation strategy milestone (e.g., extend a deadline beyond one or two years).
- A major change in biological goals and objectives or conservation measures if monitoring or research indicates that they are not attainable because technologies to attain them are either unavailable or infeasible.
- Extending the permit term beyond 50 years.
- Increasing the land acquisition requirements in excess of 5% of the original acreage requirement.

As described in Chapter 9, it is possible that, even over the full 50-year term of the permits, covered activities and authorized take might not occur to the extent projected in the Plan. If this occurs, fee revenues would likely fall short of projections. A shortfall of fee revenues could make it difficult or impossible for the Implementing Entity to complete the Reserve System, habitat restoration and creation requirements, and other components of the conservation strategy within the milestones described in Chapter 5 and Chapter 8, Section 8.12 *Schedule and Milestones* and within term of the permits. If this situation appears likely, the Permittees and the Wildlife Agencies will meet and confer to develop mutually agreeable terms, which could include, but are not limited to, the following:

- extend the term of the permits to allow completion of the conservation strategy, or
- reduce the amount of take authorized and reduce the conservation obligations of the Permittees.

## Amendment Process for the Section 10(a)(1)(B) Permits

To amend the Section 10(a)(1)(B) permits, the Implementing Entity Governing Board will submit a formal application to USFWS (or to NMFS if anadromous fish are proposed to be added to the Plan). This application must include a revised Habitat Plan, a permit application form, any required fees, a revised Implementing Agreement, and the required compliance document under NEPA. The appropriate NEPA compliance process and document will depend on the nature of the amendment being proposed. A new scoping process may be required, dependent upon the nature of the amendment. If additional scoping is deemed appropriate and necessary, USFWS and/or NMFS will publish a Notice of Intent in the Federal Register to initiate the scoping process. Upon submission of a completed application package, USFWS and/or NMFS will publish a notice

of the proposed application in the Federal Register, initiating the NEPA and HCP amendment review process. After public comment, USFWS or NMFS may approve or deny the permit amendment application.

## **Amending the NCCP Permit**

Procedures for applying for an amendment to the NCCP permit are included in the Implementing Agreement and will be processed in accordance with applicable NCCP Act requirements. The NCCP permit amendment will be subject to the requirements of CEQA, including a public review period. At the conclusion of the public review period, CDFG will either approve or deny the permit amendment. To approve the permit amendment, CDFG must make appropriate NCCP Act and CEQA findings.

## **Amendment Guidelines for Pacheco Dam Reconstruction and Reservoir Enlargement Project**

This section provides guidance for an amendment of the Habitat Plan to add the Pacheco Dam Reconstruction and Reservoir Enlargement project as a covered activity. This project is currently not a covered activity in the Plan (see Chapter 2) because it will take water from the Central Valley Project operated by the Bureau of Reclamation. A project description of the Pacheco Dam Reconstruction and Reservoir Enlargement Project adequate to complete an impacts analysis was also not available at the time of permit issuance for this Plan. Therefore, the permits for this Plan do not authorize take associated with this project. However, if SCVWD proceeds with this project, incidental take authorization could be obtained through an amendment of this Plan. Whether this Plan is amended to cover this project or not, the conservation strategy for the Pacheco Dam Reconstruction and Reservoir Enlargement Project will be consistent with the conservation strategy in this Plan.

If take authorization for this project is obtained through an amendment of the Habitat Plan the Permittees must follow all of the general requirements described above for amendments. To compensate for the additional impacts, the amendment must supplement the operating conservation strategy of this Plan.

The SCVWD will provide adequate funding to implement the modified conservation strategy and is expected to own and operate the expanded reservoir. Preserved lands will be enhanced, managed, and monitored consistent with the conservation strategy and monitoring and adaptive management program of this Plan. Land management and monitoring may be conducted by the Implementing Entity, SCVWD, or another Permittee.

The Wildlife Agencies have not provided assurances to accepting the specific terms of this amendment and will base their determination of whether or not to approve an amendment based on the conditions and analysis available at the time of application.

**Table 10-1.** Thresholds and Remedial Actions for Changed and Unforeseen Circumstances Addressed by the Plan

<b>Thresholds</b>				
<b>Circumstance</b>	<b>Changed (Funded)</b>	<b>Changed (Unfunded)</b>	<b>Unforeseen (Unfunded)</b>	<b>Remedial Actions</b>
Covered Species Listed	<ul style="list-style-type: none"> <li>Covered species listed</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>No changes to the terms and conditions of the Implementing Agreement or modifications to conservation measures are required.</li> </ul>
Non-covered species listed	<ul style="list-style-type: none"> <li>Non-covered species listed</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate potential impacts of covered activities on the newly listed species, including an assessment of the presence of suitable habitat in impact areas.</li> <li>Develop measures to fully avoid impacts on the newly listed species until the Plan is amended to cover the species or comply with ESA and CESA via other means (i.e., individual Section 7 consultations, consistency determinations).</li> </ul>
Global Climate Change	<ul style="list-style-type: none"> <li>Increase in temperature of up to 2.8°C for any of the three baseline periods measured as a 10-year running average</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>increase in temperature greater than 2.8°C for any of the three baseline periods measured as a 10-year running average</li> </ul>	<ul style="list-style-type: none"> <li>Enhance monitoring to detect ecological responses to climate change (see Chapter 7).</li> <li>Identify target species most vulnerable to climate change and increase status-and-trend monitoring for those species.</li> <li>Alter conceptual ecological models for natural communities and covered species as a tool to devise improved management actions (see Chapter 7).</li> <li>Alter or conduct more intensive management actions on target/vulnerable species to facilitate shifts in species distribution (e.g., more active population management of covered species).</li> <li>Conduct more aggressive control of invasive species that respond positively to climate change.</li> <li>Implement other measures through the Adaptive Management Program (see Chapter 7) in ways consistent with permit obligations and with the consent of the Implementing Entity.</li> </ul>
Fire	<ul style="list-style-type: none"> <li>A single fire burning 2,235-7,599 acres in the Reserve System</li> <li>Any number of fires of any size that impact enhancement, restoration or creation projects<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>A single fire exceeding 7,599 acres in the Reserve System</li> <li>More than one fire in the Reserve System burning an excess of 7,599 acres</li> <li>Burned areas not containing enhancement,</li> </ul>	<ul style="list-style-type: none"> <li>Initiate a post-fire damage assessment within six months following the end of a fire in order to identify the appropriate post-fire restoration and rehabilitation actions.</li> <li>Initiate the appropriate actions, such as habitat restoration, invasive-species control and/or erosion control, in affected reserves to ensure the reestablishment of covered plants and other native vegetation through active or passive means, as appropriate, within one year post-fire.</li> </ul>

<sup>1</sup> For any individual fire exceeding 7,599 acres, remedial actions would be limited to enhancement, restoration and/or creation project sites (i.e., the entire burned area would not be subject to remedial actions).

Table 10-1. Continued

Thresholds				
Circumstance	Changed (Funded)	Changed (Unfunded)	Unforeseen (Unfunded)	Remedial Actions
	<ul style="list-style-type: none"> <li>Any number of fires, regardless of size, in the same area of the Reserve System at the following frequencies (see <b>Table 10-2</b>)               <ul style="list-style-type: none"> <li>Grasslands: <math>\geq 5</math> years</li> <li>Chaparral/coastal scrub: <math>\geq 5</math> years</li> <li>Oak woodland: <math>\geq 10</math> years</li> <li>Riparian: <math>\geq 25</math> years</li> <li>Conifer woodland: <math>\geq 5</math> years</li> <li>Wetland: <math>\geq 5</math> years</li> </ul> </li> <li>Any number non-catastrophic fires of any size that impacts restoration or creation projects</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Wildfires that reoccur in the same location below the threshold identified in <b>Table 10-2</b></li> </ul>	<ul style="list-style-type: none"> <li>Implement measures through the Adaptive Management Program (see Chapter 7) in ways consistent with permit obligations and with the consent of the Implementing Entity.</li> <li>Ensure erosion control measures are in place prior to the next rainy season.</li> </ul>
Nonnative Species or Disease	<ul style="list-style-type: none"> <li>Infestations of new diseases or new nonnative invasive species affecting up to 25% of a predominant natural community (i.e., oak woodland) or covered species within the Reserve System at any given time</li> </ul>	<ul style="list-style-type: none"> <li>Infestations of new diseases or new nonnative invasive species affecting more than 25% of a predominant natural community (i.e., oak woodland) or covered species within the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Determine the best method for measurement and tracking extent within 3 months of detection.</li> <li>Prepare a damage-assessment report within 6 months of detection.</li> <li>Recommend and plan actions to address the threat within 6 months of detection.</li> <li>Respond through adaptive management in ways consistent with permit obligations and with the consent of the Wildlife Agencies within one year of detection.</li> </ul>
	<ul style="list-style-type: none"> <li>Spread of existing nonnative species or diseases up to 25% above current conditions within the Reserve System at any given time</li> </ul>	<ul style="list-style-type: none"> <li>Spread of existing nonnative species or diseases more than 25% above current conditions within the Reserve System</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	



Table 10-1. Continued

Thresholds				
Circumstance	Changed (Funded)	Changed (Unfunded)	Unforeseen (Unfunded)	Remedial Actions
Flooding	<ul style="list-style-type: none"> <li>All flood events that damage or destroy enhancement projects, restoration projects, creation projects, or in-stream conservation structures</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate site to determine appropriate corrective actions necessary to restore the habitat through active management or natural processes.</li> <li>Implement appropriate corrective actions (i.e., grading, new riparian plantings, debris removal, covered plant restoration, etc.) within a time period to maintain permit compliance with the Stay-Ahead provision for restoration, creation, and enhancement.</li> </ul>
Drought	<ul style="list-style-type: none"> <li>Up to 7 droughts of one to eight years each, of which, only a single drought is expected to last up to 8 successive years</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>More than 7 droughts during permit term</li> <li>More than a single drought of 8 successive years</li> <li>Any number of droughts lasting more than 8 successive years each</li> </ul>	<ul style="list-style-type: none"> <li>Prepare damage assessment report within one year of damage or loss.</li> <li>Identify actions to improve effects on covered species (e.g., provision of temporary artificial water sources) within one year of damage or loss.</li> <li>Identify actions to improve effects on enhanced and restored habitat (e.g., supplemental irrigation) within one year of damage or loss.</li> <li>Implement measures through the Adaptive Management Program (see Chapter 7) in ways consistent with the permit obligations and with the consent of the Implementing Entity within one year of damage or loss.</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>Damage to Reserve System infrastructure, natural communities, and covered species from any number of earthquakes of any magnitude</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Repair or rebuild Reserve System infrastructure within 2 years of earthquake.</li> <li>Remediate enhancement, restoration, and creation sites in the Reserve System that may have been affected (i.e., as a result of landslides) within 2 years of earthquake.</li> <li>Conduct post hoc monitoring of species or populations that are identified as being potentially negatively affected by the incident for 3 years following the earthquake.</li> </ul>

**Table 10-2.** Natural Community-Specific Fire Return Intervals

Natural Community	Fire to Return Interval <sup>1</sup> (Average Years)				Return Intervals (years) Defining Unforeseen Circumstance
	Classification <sup>2</sup>	Pre-Historic <sup>3</sup>	Historic <sup>3</sup>	Current <sup>4</sup>	
Grassland	Truncated short-short	1 to 2	10 to 30	25 to 35	< 5
Chaparral/coastal scrub	Truncated short-medium	1 to 2 1 to 15 10 to 35	10 to 30 20 to 30 7 to 29	25 to 35 125 to 250	< 5
Oak woodland	Truncated short-medium	1 to 2 10 to 35 30 to 135	50 to 75 10 to 30	150 to 250 25 to 35	< 10
Riparian forest and scrub	Long	–	–	Over 100 years	< 25
Conifer woodland	Short-long	135	20 to 50 4 to 12	50, 9 to 16 100 to 150	< 5
Wetland <sup>5</sup>	Short	1 to 2	10 to 30	25 to 35	< 5

<sup>1</sup> Multiple fire return intervals are stated for some of the natural communities due to variable fire return intervals stated for the land cover types within each natural community grouping. In addition, fire return intervals are highly variable for individual land cover types (e.g., redwood) depending on site specific variables (e.g., location, topographical isolation).

<sup>2</sup> Sugihara et al. (2006) identified six conceptual fire-return interval patterns occurring in California ecosystems. Ecosystems with a *truncated short fire return interval* experience all-area burns reoccurring at short interval. Longer return intervals for these ecosystems result in type conversion. Ecosystems with a *short fire return interval* experience large-area burns reoccurring at a short interval; however, there is a wide range including a small portion with longer intervals. Long intervals punctuated by short interval burns allow for greater complexity of non-dominate species. *Truncated medium fire-return interval* ecosystems experience a range of area burns. Upper and lower limits are defined by characteristic species life histories. Intervals outside range result in type conversion. *Medium fire-return interval* ecosystems experience area burns at medium-return intervals; however, deviation from interval does not usually result in type conversion. Ecosystems with a *truncated long fire-return interval* experience all-area burns at long intervals, typically 70 or more years; however, repeat fires within a few years or decades do not result in type conversion. *Long fire-return interval* ecosystems have long partial-area or all-area fire-return intervals. Shorter, reoccurring fires may occur in small areas without type conversion occurring.

<sup>3</sup> Return interval influenced by burning conducted by Native Americans (pre-historic) and Europeans (historic).

<sup>4</sup> Return interval influenced by fire suppression.

<sup>5</sup> Assumed to be the same as grassland.

Sources: Davis and Borchert 2006; Stuart and Stephens 2006; Sugihara et al. 2006; Willis 2006.

**Table 10-3.** Modeled Habitat for Eligible Covered Species found on Eligible Neighboring Lands<sup>1</sup>

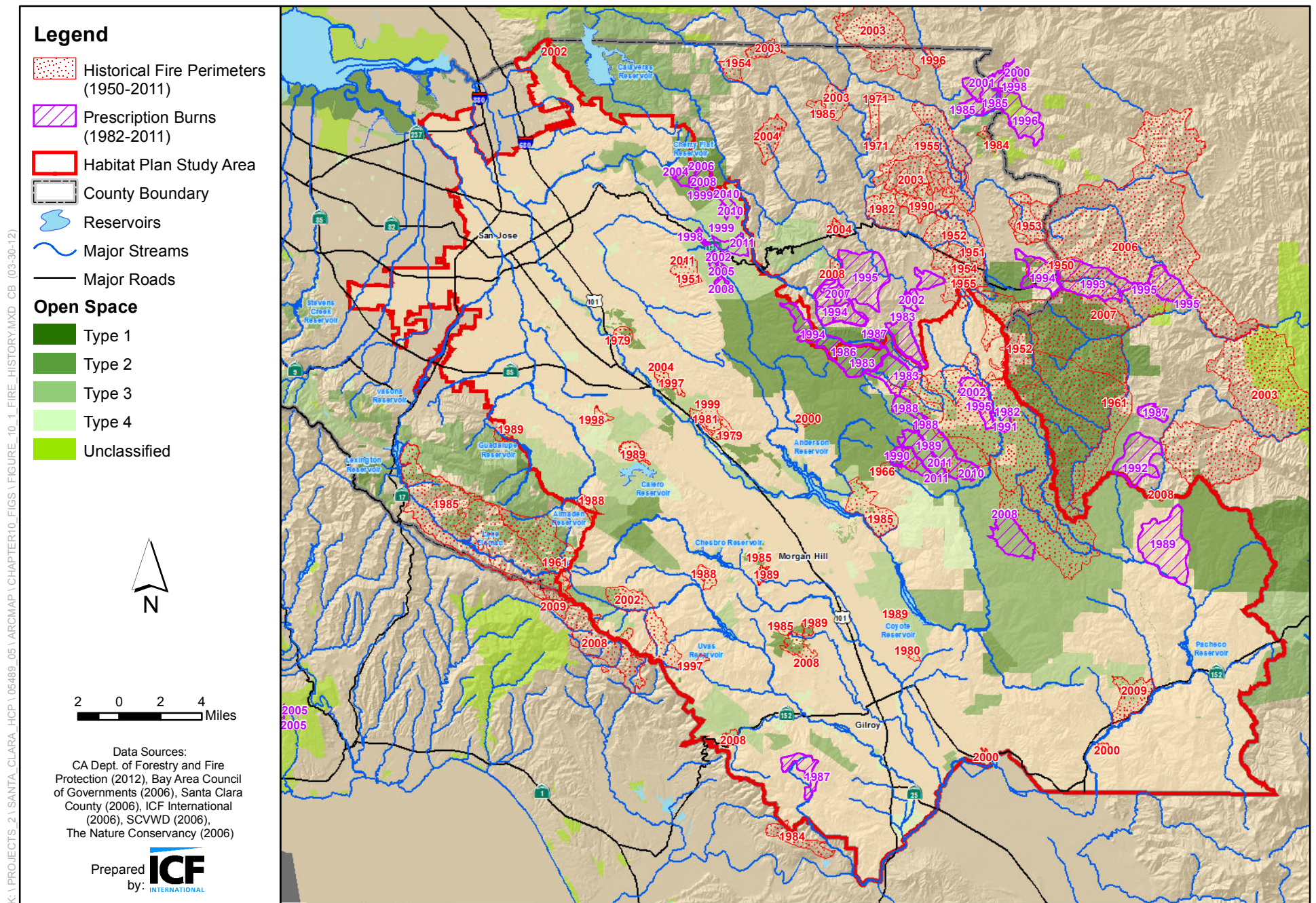
	Primary Habitat	Secondary Habitat	Dispersal Habitat	Total
California red-legged frog	51 acres	0 acres <sup>2</sup>	17,951 acres	18,002 acres
California tiger salamander	0 acres	19,189 acres	N/A	19,189 acres
Western pond turtle	2,421 acres	12,732 acres	N/A	15,153 acres

Notes:

<sup>1</sup> Assumes maximum amount of land eligible for program. This analysis assumes that none of the existing cultivated agriculture eligible for the program will be lost to covered activities.

<sup>2</sup> Refugia habitat.







## Chapter 11

# Alternatives to Take

The ESA requires that applicants for incidental take permits specify in an HCP what alternative actions to the take were considered and the reasons why those alternatives were not selected. The *Endangered Species Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998) identifies two alternatives commonly used in HCPs: (1) an alternative that would reduce take below levels anticipated for the proposed project and (2) an alternative that would avoid take and hence not require a permit from USFWS. The NCCP Act requires that project alternatives be considered in the EIR prepared for the NCCP (Section 2820[e]) but not in the NCCP itself.

This chapter identifies alternative measures considered that would avoid or minimize the potential for take of each wildlife species covered in this Plan. The following discussion is limited to wildlife species because the ESA requires alternatives to *take*. Take of listed plants is not prohibited by the ESA, and projects subject to Section 7 consultations will evaluate listed plants in the Biological Assessment and Biological Opinion associated with that consultation. As of the effective date of the Federal permit, take of covered species that are currently federally listed will be authorized as described in the Plan. Project alternatives are considered in more detail in the draft EIR/EIS that accompanies this draft Plan. This chapter evaluates alternatives to take for all of the wildlife species covered by the Plan:

- Bay checkerspot butterfly (threatened)
- California red-legged frog (threatened)
- California tiger salamander (threatened)
- Foothill yellow-legged frog
- Western pond turtle
- Least Bell's vireo (endangered)
- Western burrowing owl
- Tricolored blackbird
- San Joaquin kit fox (endangered)

## 11.1 Alternatives to Take of Bay Checkerspot Butterfly

The only known extant populations of Bay checkerspot butterfly occur within the study area. Primary impacts to this species include the expansion of urban areas or rural residential development that removes or isolates serpentine grassland habitat. These changes in land use can also increase recreational use on or limit the management of serpentine grasslands, which could also adversely affect the butterfly. Additionally, covered activities that facilitate future growth along the U.S. 101 corridor could lead to an increase in the amount of vehicle traffic and increase the rate of nitrogen deposition on serpentine grasslands in the permit area. Increased nitrogen deposition is known to change the alkalinity of serpentine soils, which reduces the competitive advantage that native plants experience in these areas, resulting in decreased abundance of the native host and larval plants of the Bay checkerspot butterfly (see discussion in Chapter 4 *Impact Assessment and Level of Take*).

Also, certain management actions for Bay checkerspot butterfly under the Plan could result in take of the species. Management actions will include livestock grazing and, in some areas, controlled burning to reduce the cover of nonnative plant species. Targeted use of herbicides, mowing, hand-weeding, or other aggressive removal techniques will be necessary in small areas to combat infestations of noxious weeds in serpentine grasslands such as barbed goatgrass. All of these actions could kill individual butterflies or their larvae. If Bay checkerspot butterflies do not disperse to new suitable habitat on their own the Implementing Entity may translocate butterflies to establish new populations in these areas, upon approval by the Wildlife Agencies. If translocation is implemented, butterfly mortality could occur during or after movement. Given these risks of mortality, one alternative is not to implement the management actions as described in the conservation strategy (see Chapter 5). This alternative is not preferred because active management is essential for the maintenance of the suitable habitat for the species. The benefits of this active management far outweigh the negative effects it may have on a small number of individuals. The management actions described in the conservation strategy will greatly benefit the species and will contribute substantially to its recovery.

An alternative prohibiting development on serpentine soils within the permit area would reduce but not eliminate take of the species, since nitrogen deposition from existing road traffic would continue to alter plant composition to the detriment of Bay checkerspot butterfly. This alternative is inconsistent with the currently adopted general plans of local jurisdictions and would therefore be infeasible.

In addition, because nonnative plants threaten to outcompete the host and nectar plants necessary for Bay checkerspot butterfly survival, some form of management is needed to maintain and increase viable habitat for the species. An alternative that eliminates take does not create a mechanism by which land is managed for the benefit of the butterfly and therefore is biologically inferior to the approach proposed by the Habitat Plan.

An alternative that limits growth or reduces traffic along the U.S. 101 corridor could reduce impacts to Bay checkerspot butterfly. However, this approach is infeasible because much of the traffic on U.S. 101 comes from outside the jurisdictions participating in this Plan. Furthermore, limiting growth along U.S. 101 is inconsistent with the approved general plans of the County and the Cities of San José, Morgan Hill and Gilroy.

In summary, implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, Bay checkerspot butterfly in the permit area. Serpentine grasslands will be protected and managed to the benefit of the species. Up to 300 acres (4%) of modeled primary habitat will be permanently affected by covered activities, but impacts would be limited to no more than 3% of the unprotected portion of each core and satellite habitat unit targeted for conservation (as defined in **Table 5-7**) with the exception of the Kirby/East Hills core unit which has a 11% allowance to accommodate the Kirby Landfill expansion (80 acres). The Reserve System will protect an estimated 3,800 acres of modeled primary habitat, all of which will be enhanced. An additional 754 acres of modeled primary habitat will be added to the Reserve System from existing open space, within which, degraded habitat will also be enhanced. This will result in a 341% increase of lands managed as primary habitat in type 1 open space and a total of 62% of existing modeled habitat preserved in type 1 open space. New reserves will ensure protection of the ranges of slopes, aspects, and microhabitats important to the species. Reserve management of habitat will enhance populations of larval host plants and adult nectar sources to allow for natural migration across reserves. These and additional management actions (see Chapter 5 *Conservation Strategy*) along with avoidance and minimization measures (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any alternatives that may reduce take.

## 11.2 Alternatives to Take of California Red-Legged Frog

California red-legged frogs utilize several land cover types for breeding and summer refugia, including riverine habitats, seasonal wetlands, freshwater marshes, and ponds. Frogs also aestivate in a variety of upland land cover types including annual grassland and oak woodland. As a result, impacts to California red-legged frog could occur from numerous covered activities that remove aquatic or upland habitats or that temporarily disturb areas utilized by the frog. These covered activities include urban and rural development as well as implementation of in-stream capital projects, rural water-supply projects, related operations and maintenance, and, to a lesser extent, implementation of the conservation strategy.

Take of California red-legged frog could be minimized or avoided if these covered activities did not encroach on habitat for this species; fill or disturb breeding or summer refugia sites (e.g., ponds, seasonal wetlands, streams); or



remove aestivation or movement habitat connecting breeding sites. Because habitat for the species is widespread (especially upland aestivation or dispersal habitat), avoidance of all take is infeasible. Similarly, in-stream capital projects, water-supply projects and related operations and maintenance have the potential to take red-legged frogs. However, failing to carry out flood control, as well as other needed services would jeopardize human health and safety and would not be feasible.

Conservation and management actions that take place on the Reserve System, particularly those that enhance, restore, or create habitat, have the potential to take California red-legged frogs. Increasing the connectivity between breeding sites and increasing the frequency of monitoring surveys in the study area have the potential to facilitate the spread of detrimental environmental factors (e.g., chytrid fungus, nonnative predators). Although these actions could harm individual frogs, they are designed to provide a substantial net benefit to the species on the reserves. Ultimately the benefits gained from Plan implementation are expected to strongly outweigh any potential impacts or take. Under the Plan, take will be minimized or avoided through implementation of the following conditions on development discussed in Chapter 6:

- Condition 3. *Maintain Hydrologic Conditions and Protect Water Quality.*
- Condition 4. *Avoidance and Minimization for In-Stream Projects.*
- Condition 5. *Avoidance and Minimization Measures for In-Stream Operations and Maintenance.*
- Condition 11. *Stream and Riparian Setbacks.*
- Condition 12. *Wetland and Pond Avoidance and Minimization.*

Take of California red-legged frog as a result of urban development could be avoided entirely if projects did not encroach on or near habitat for red-legged frog. However, this alternative is not feasible because it is inconsistent with adopted local General Plans and fails to meet the purpose and need of the Permittees to achieve reasonable amounts of urban development and growth within their jurisdictions.

Another alternative to take from urban expansion is to require all development projects to avoid direct impacts to suitable habitat for this species. Presumably each project would be able to build on a portion of the site while setting aside the portion of the site suitable for the species. This alternative approach, however, would result in a patchwork of habitat that would not function well biologically on a regional scale because it would be interspersed with urban and rural development. In addition, this alternative would not address the indirect effects associated with development (e.g., decreased water quality, increased harm and harassment from humans and their pets). Therefore, this alternative was rejected because it would result in a biologically inferior outcome. The Plan is designed to accept a limited amount of take of red-legged frog habitat in exchange for protection, enhancement, and restoration of high-quality habitat outside urban and urbanizing areas. Most of the take will be in lower-quality habitat, although some of it will occur in higher-quality habitat as well.

Implementation of this Plan is expected to provide a net benefit to, and contribute to the recovery of, California red-legged frog in the permit area. The red-legged frog is threatened by loss of habitat and extensive fragmentation both between summer refugia and breeding sites and among wetland/pond complexes. Up to 415 acres (4%) of modeled primary habitat and 14,426 acres (4%) of secondary habitat will be affected by covered activities. The Reserve System will acquire, protect and enhance an estimated 1,300 acres of primary habitat and 30,000 acres of secondary habitat. In addition, 130 acres of primary habitat, 11,800 acres of secondary habitat will be added to the Reserve System from existing open space. Degraded habitat within existing open spaces added to the Reserve System will also be enhanced. This will result in an increase of 93% of modeled habitat in type 1 open space and a total of 26% of modeled habitat in type 1 open space. In addition to the Plan's requirements for California red-legged frog habitat acquisition, an estimated 117 acres of perennial wetlands and ponds and 10.4 miles of stream will be created or restored in the Reserve System if all impacts under the Plan occur. Some of these creation and restoration sites may be suitable habitat for the California red-legged frog. A network of core reserves will protect large blocks of breeding and non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the study area and movement between breeding sites. Habitat management will improve quality of breeding habitat (e.g., predator eradication, woody debris and native vegetation installation, stream and riparian restoration) and upland habitat. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit California red-legged frog in the permit area to a greater degree than any considered alternatives.

## 11.3 Alternatives to Take of California Tiger Salamander

California tiger salamanders utilize seasonal wetlands, marshes, and ponds during different times of the year, and upland habitat in close proximity to water habitat. Ponds and wetlands in the study area provide breeding habitat for California tiger salamander and adjacent uplands habitat accommodate year-round uses (e.g., upland refugia and dispersal).

California tiger salamander could be taken by rural development; a small portion of urban development; conversion of habitat to agriculture (e.g., vineyards); implementation of in-stream capital projects, rural water-supply capital projects and related operations and maintenance; and implementation of the conservation strategy. These projects could impact suitable breeding ponds and wetlands or suitable upland refugia. Rural development could also cause fragmentation of breeding habitat.

Take of California tiger salamander by rural development could be reduced by requiring all development projects to avoid all suitable habitat for this species.

However, as for the California red-legged frog, this alternative approach would result in a patchwork of habitat that would not function well biologically. Therefore, this alternative conservation approach was rejected because it would result in a biologically inferior outcome. The Plan is designed to accept a limited amount of impacts to tiger salamander habitat in exchange for protection, enhancement, and restoration of higher-quality habitat outside urban areas. Most of the take will be in lower-quality habitat, although a limited amount will be in higher-quality habitat. In addition, ancillary benefits for the California tiger salamander are gained through water quality protections required by Condition 3 and stream setbacks required by Condition 11 (see Chapter 6 *Conditions on Covered Activities and Application Process*).

Another alternative that may reduce take of California tiger salamander in the study area is the prohibition of irrigated agriculture on suitable breeding or movement/upland refugia habitat. However, only agricultural activities that require a County permit are covered by this Plan. Irrigation that is part of routine and ongoing agriculture does not require a permit from the County, and therefore is not subject to the restrictions of this Plan. In addition, most agriculture in the study area occurs on the valley floor, while known occurrences of California tiger salamander are generally in the foothills outside the valley floor. In addition, a “freedom to farm” policy in the County makes regulation of agriculture difficult to implement. Therefore, this alternative was rejected.

Some of the management actions prescribed by this Plan may cause take of some individual California tiger salamanders. Specifically, increasing the connectivity between breeding sites and increasing the frequency of monitoring surveys in the study area have the potential to facilitate the spread of detrimental environmental factors (e.g., chytrid fungus, nonnative predators). It is also possible that increasing connectivity and the number of California tiger salamander populations could further facilitate hybridization between the California tiger salamander and the Texas salamander. However, the conservation strategy includes management and research actions to prevent or reduce these threats. Ultimately the benefits gained from Plan implementation are expected to strongly outweigh any potential impacts or take.

Implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, California tiger salamander in the permit area. The tiger salamander is threatened by loss of habitat and extensive fragmentation both between upland and breeding sites and among wetland/pond complexes. Up to 91 acres (9%) of modeled breeding habitat and 14,384 acres (4%) of modeled non-breeding habitat will be affected by covered activities. The Reserve System will acquire and protect an estimated 150 acres of breeding habitat and 30,000 acres of non-breeding habitat. In addition, 45 acres of breeding habitat and 11,700 acres of non-breeding habitat will be added to the Reserve System from existing open space. This will result in an increase of 91% of lands managed as species habitat in type 1 open space and a total of 27% of existing modeled habitat preserved in type 1 open space. Within the Reserve System an estimated 147 acres of perennial wetlands, seasonal wetlands, and ponds will be created or restored if all impacts under the Plan occur. Some of these creation and restoration sites may be suitable habitat for the California tiger salamander.

A network of core reserves will protect large blocks of breeding and non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the study area and movement between breeding sites. Habitat management will improve the quality of breeding habitat (e.g., predator eradication and wetland enhancement and restoration) and upland habitat. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.4 Alternatives to Take of Foothill Yellow-Legged Frog

Foothill yellow-legged frogs require shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate. This species would be affected by projects implemented in the stream channel or that result in the removal of cobblestone substrate or riparian vegetation, particularly in reaches above reservoirs. Ground-disturbing activities, such as maintenance of stream banks, levees, and channel rights-of-way (e.g., bank repair, vegetation management), could increase erosion and sediment discharge that could disrupt breeding of foothill yellow-legged frogs. Projects that place structures in the channel (e.g., culvert installation) or that require stream access may crush individuals and expose adults, metamorphs, and tadpoles. If water pulses from reservoirs are released during the foothill yellow-legged frog egg-laying period, they could dislodge egg masses, causing mortality.

One alternative to take of yellow-legged frog would be to refrain from implementing flood-control and other in-stream capital projects. However, this alternative would not provide flood protection to many neighborhoods and areas that are currently vulnerable to flooding. In addition, many of these flood-control projects are part of the SCVWD Clean, Safe Creeks and Natural Flood Protection Plan or the Coyote Watershed Stream Stewardship Plan. The former is a 15-year, countywide plan funded by a special tax that directs the SCVWD to protect public health and safety, in part through the construction of flood-control projects. The latter plan was developed by the SCVWD to address flooding and environmental issues in the Coyote watershed through an integrated approach to watershed management. The alternative of not implementing in-stream capital projects is infeasible because it would not provide needed flood protection and because it is inconsistent with the adopted and funded plans of SCVWD.

Another alternative to take of yellow-legged frog is to refrain from levee improvements within the study area. However, this would be out of compliance with levee-recertification requirements being developed by the Federal Emergency Management Agency and would affect public safety. Therefore this is not a feasible alternative.

Implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, foothill yellow-legged frog in the permit area. Up to 8.7 stream miles (<1%) of modeled primary and secondary habitat will be affected by covered activities. The Reserve System will protect an estimated 30 stream miles of modeled primary habitat and 50 miles of modeled secondary habitat. In addition, 7 stream miles of modeled primary habitat and 17 stream miles of modeled secondary habitat will be added to the Reserve System from existing open space. This will result in an 88% increase of protected modeled primary and secondary habitat in type 1 open space and protection of a total of 32% of modeled primary and secondary habitat in type 1 open space. In addition to the Plan's acquisition requirements of primary foothill yellow-legged frog habitat, the Reserve System will contain an estimated 10.4 miles of restored streams if all impacts under the Plan occur. Some of these 10.4 miles of restored streams may also be suitable for the foothill yellow-legged frog. Protection of streams with perennial flows will target reaches with high habitat value or restoration potential. Restoration and enhancement of perennial streams will ensure improvement of habitat quality and breeding success. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.5 Alternatives to Take of Western Pond Turtle

Western pond turtles utilize riverine habitats as well as seasonal wetlands, marshes, ponds, and upland habitat in close proximity to water. Uplands in the study area adjacent to ponds and wetlands with the appropriate soil substrate provide breeding habitat for western pond turtle, and adjacent upland habitat also accommodates year-round uses (e.g., aestivation, refugia, dispersal). In addition, this species requires basking sites in the water for year-round use.

Western pond turtle could be affected by rural development; a small portion of urban development; conversion of habitat to agriculture (e.g., vineyards); implementation of in-stream capital projects, rural water-supply capital projects and related operations and maintenance; and implementation of the conservation strategy. These projects could impact suitable breeding uplands adjacent to ponds and wetlands or suitable upland aestivation habitat. Rural development could also cause fragmentation of breeding habitat.

Take of western pond turtle by rural development could be reduced by requiring all development projects to avoid all suitable habitat for this species. However, as discussed above for the California red-legged frog, this alternative approach would result in a patchwork of habitat that would not function well biologically. Therefore, this alternative conservation approach was rejected because it would result in a biologically inferior outcome. The Plan is designed to accept a limited amount of impact to pond turtle habitat in exchange for protection, enhancement, and restoration of higher-quality habitat outside urban areas. Most of the take will be in lower-quality habitat, although a limited amount will be in higher-

quality habitat. In addition, indirect impacts to riverine habitat are avoided and minimized through water-quality protections required by Condition 3 and stream setbacks required by Condition 11 (see Chapter 6 *Conditions on Covered Activities and Application Process*).

Another alternative that may reduce take of western pond turtle in the study area is the prohibition of irrigated agriculture on suitable breeding or movement/aestivation habitat. However, only agricultural activities that require a County permit are covered by this Plan. Irrigation is part of routine and ongoing agriculture, does not require a permit from the County, and therefore is not subject to the restrictions of this Plan. In addition, most agriculture in the study area occurs on the valley floor, while known occurrences of western pond turtle are generally in the foothills outside the valley floor. Also, a “freedom to farm” policy in the County makes regulation of agriculture difficult to implement. Therefore, this alternative was rejected.

Implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, western pond turtle in the permit area. Up to 2,264 acres (3%) of modeled primary habitat and 8,811 acres (4%) of secondary habitat will be affected by covered activities. The Reserve System will acquire and protect an estimated 7,000 acres of modeled primary habitat and 20,000 acres of modeled secondary habitat. In addition, 2,800 acres of primary habitat and 9,100 acres of secondary habitat will be added to the Reserve System from existing open space. This will result in an 87% increase of lands managed as species habitat in type 1 open space and preservation of a total of 27% of existing modeled habitat in type 1 open space. Within the Reserve System, a minimum of 20 acres of ponds will be created and 1 stream mile restored, regardless of impacts. If all impacts under the Plan occur, up to 72 acres of ponds and 10.4 miles of streams will be created or restored. Some of these creation and restoration sites may be suitable habitat for the western pond turtle. A network of core reserves will protect large blocks of breeding and non-breeding habitat. New linkages will be created in blocks of modeled habitat to facilitate dispersal and colonization throughout the study area and movement between breeding sites. Habitat management will improve quality of breeding habitat (e.g., predator eradication and access control programs, woody debris and native vegetation installation) and upland habitat (e.g., grassland management). These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.6 Alternatives to Take of Least Bell’s Vireo

Least Bell’s vireo is currently not known to breed in the study area, but it has been observed foraging on both Llagas and Coyote Creeks in the study area in recent years. It has also been documented successfully breeding east of the study area, in the San Joaquin River National Wildlife Refuge, for two consecutive years. It is reasonable to assume that the species breeding and foraging range

will expand northward into the study area, especially given that riparian habitat will be preserved, enhanced, and restored during the permit term. Therefore, the Plan anticipates impacts to and conservation of the species and its habitat.

Least Bell's vireos breed in the early successional riparian habitat during the spring and summer months.

Take of least Bell's vireo could result from covered activities that remove or alter early successional riparian habitat within the study area, particularly in the southern part of the study area. Impacts could also occur from any activity that diminishes dynamic riverine events (i.e., floods) that create early successional habitats, although such action may not rise to the level of take. Additional direct and indirect impacts could occur from adjacent land uses that alter associated riverine habitat or increase nearby populations of nest predators (e.g., domestic cats) or nest parasites (e.g., brown-headed cowbirds). While take of most migratory birds is prohibited under the Migratory Bird Treaty Act of 1918, take of least Bell's vireo would be permitted under a Special Purpose Permit for ESA-listed species (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998: Appendix 5).

Alternative covered activities that do not include in-stream capital flood-control projects or vegetation removal for stream maintenance could reduce or eliminate impacts to least Bell's vireo. However, this alternative would put the upstream communities of Gilroy and Morgan Hill and unincorporated portions of the County at greater risk of flooding. It would also be incompatible with the Clean, Safe Creeks and Flood Protection Plan, a 15-year, countywide, special-tax-funded plan, which directs the SCVWD to protect public health and safety, in part through the construction of flood-control projects. Because the vireo requires early successional habitats, some vegetation removal is likely necessary to maintain suitable habitat. For these reasons, this alternative was rejected.

Implementation of this Plan is expected to provide a net benefit to least Bell's vireo in the permit area. Up to 115 acres (4%) of modeled primary habitat will be affected by covered activities. The Reserve System will acquire and protect a minimum of 460 acres of modeled primary habitat. In addition, 2 acres of modeled primary habitat will be added to the Reserve System from existing open space. All species habitat will be enhanced. This will result in a 865% increase of preserved modeled habitat as type 1 open space and a total of 20% of modeled habitat preserved as type 1 open space. In addition to the Plan's acquisition requirements of least Bell's vireo primary habitat, the Reserve System will include a minimum of 50 acres of restored riparian forest and scrub, regardless of impacts. If all impacts under the Plan occur, up to 353 acres of riparian forest and scrub and Central California alluvial sycamore woodland will be restored, some of which may be primary habitat for the least Bell's vireo. New reserves will increase habitat connectivity by targeting areas along rivers. Habitat management will ensure improvement of habitat quality and favor increased reproductive success through riparian woodland and forest enhancement and restoration. The Plan also requires 1:1 restoration for any loss of riparian forest and scrub communities (including *willow riparian forest and scrub* and *mixed riparian forest and woodland*, see **Table 5-12** and text in Chapter 5 *Conservation*

*Strategy*) These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.7 Alternatives to Take of Western Burrowing Owl

Western burrowing owl habitat includes annual grassland, serpentine bunchgrass grassland, valley oak woodland, agricultural, barren land cover types with flat (0–5%) or moderate (5–25%) slopes, and ruderal habitats on the valley floor. Only a few of these sites, primarily in San José, are occupied by breeding owls on a consistent basis, but there is the potential for these small pockets of habitat to support breeding pairs. Specific sites that support the owl are targeted for nearby land acquisition to protect this species and provide additional habitat for fledging young birds. Western burrowing owls use the ground squirrel burrows for shelter and breeding. Primary threats to this species by covered activities include development of their habitat in suburban and rural areas and ground squirrel control along levees and dams and in rural areas. While take of most migratory birds is prohibited under the Migratory Bird Treaty Act of 1918, take of western burrowing owl would be permitted under a Special Purpose Permit in the event that this species was federally listed (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998: Appendix 5).

An alternative to covered activities that eliminate or greatly reduce suburban or rural development could reduce take of the western burrowing owls and their habitat. However, based on general conservation biology principles development within already developed areas is preferable in order to reduce impacts to other covered species. Areas that are near known owl populations are targeted for protection and/or management within the Reserve System (see Section 5.4.6 *Western Burrowing Owl*). Therefore, an alternative to eliminate development in burrowing owl habitat was rejected.

An alternative to rodent control on levees was also considered. However, ground squirrel burrows can destabilize levees and dams, and eliminating ground squirrel control measures would not be consistent with the SCVWD Dam Maintenance Program or SCVWD stream maintenance needs. Therefore, this alternative was rejected.

Implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, western burrowing owl in the permit area. Up to 10,443 acres (8%) of modeled overwintering habitat will be affected by covered activities. The Reserve System will acquire and protect an estimated 17,000 acres of modeled species overwintering habitat and acquire or manage 5,300 acres of western burrowing owl nesting habitat (occupied and potential). Of the 5,300 acres, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement. For the remaining 4,700 acres, land acquisition (fee title or easement) or management agreements may be used,



with land acquisition prioritized over management agreements. In addition, 4,310 acres of modeled overwintering habitat will be added to the Reserve System from existing open space. The geographic breakdown of these newly managed areas for burrowing owls would include the following minimum acreages: 3,700 acres in the North San José/Baylands region, 800 acres in the Gilroy region, 530 acres in the Morgan Hill region, and 270 acres in the South San José region as shown in **Figure 5-10**. The conservation strategy will ensure management of both breeding and overwintering habitat. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.8 Alternatives to Take of Tricolored Blackbird

Tricolored blackbirds breed colonially in freshwater marshes and other wetland habitats with reeds, cattails, or other emergent or non-emergent wetland vegetation (such as blackberry). This species also requires foraging habitat that includes agricultural fields, wetlands, marshes, annual grassland, and riparian scrub. Potential tricolored blackbird breeding sites will be directly affected by any covered activities that result in the removal or permanent alteration of wetland or marsh habitat and/or adjacent foraging habitat. Conversion of lands from native or agricultural land cover to rural, suburban or urban use could result in the degradation of foraging habitat for this species. While take of most migratory birds is prohibited under the Migratory Bird Treaty Act of 1918, take of tricolored blackbird would be permitted under a Special Purpose Permit in the event that this species was federally listed (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998: Appendix 5).

An alternative that prohibits development in or closely adjacent to marshes, wetlands and wetland vegetation would reduce take of tricolored blackbird habitat. Currently, the Plan includes extensive avoidance and minimization measures for these habitats (see Conditions 11 and 12 in, Chapter 6 *Conditions on Covered Activities and Application Process*) as well as specific conditions to survey for and avoid tricolored blackbird populations and individuals (see Condition 17 in Chapter 6 *Conditions on Covered Activities and Application Process*). The Plan also includes required conservation measures for habitat creation and preservation to ensure at least 2 acres of freshwater wetlands are preserved and one acre restored for each acre of freshwater wetlands lost to covered activities. Similarly, impacts to streams require 3:1 preservation and 1:1 restoration.

Alternative covered activities that do not include in-stream capital flood-control projects or vegetation removal for stream maintenance could reduce or eliminate impacts to tricolored blackbird. However, this alternative could put the upstream areas at greater risk of flooding and it would also be incompatible with the Clean, Safe Creeks and Flood Protection Plan of SCVWD. Therefore, this alternative was rejected.

Alternatives that entirely eliminate conversion of native or agricultural land to rural, suburban or urban use could prevent some take of tricolored blackbird foraging habitat, however this option is incompatible with the County General Plan and the General Plan of the cities of Gilroy and Morgan Hill (there will be little agricultural conversion in San José) and was therefore rejected. Further, surveys during the design phase of a project will require avoidance and minimization of impacts to tricolored blackbird (see Condition 17 in Chapter 6 *Conditions on Covered Activities and Application Process*).

Implementation of this Plan is expected to provide a substantial net benefit to, and contribute to the recovery of, tricolored blackbird in the permit area. Up to 11,454 acres (8%) of modeled habitat will be affected by covered activities. The Reserve System will acquire and protect an estimated 19,000 acres of modeled species habitat. In addition, 3,840 acres of modeled species habitat will be added to the Reserve System from existing open space. All species habitat within the Reserve System will be enhanced. This will result in a 207% increase of lands managed as species habitat and the protection of a total of 24% of existing modeled habitat as type 1 open space. Within the Reserve System, a minimum of 40 acres of ponds and perennial wetlands will be created or restored, regardless of impacts. If all impacts under the Plan occur, up to 117 acres of ponds and perennial wetlands will be created or restored. Some of these creation and restoration sites may be suitable habitat for the Tricolored blackbird. New reserves will ensure protection of at least four currently occupied or historic breeding sites and nearby foraging habitat. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

## 11.9 Alternatives to Take of San Joaquin Kit Fox

The primary impact to San Joaquin kit fox from covered activities is additional habitat fragmentation and associated reduction of adequate corridors in the southern portion of the study area near the Pajaro River and Pacheco Creek. The primary mechanism of this impact is human population growth in Gilroy and increased urbanization in southeastern Gilroy and limited rural development along the SR 152 corridor east of Gilroy (within unincorporated Santa Clara County). San Joaquin kit fox may move through the southeastern portion of the study area from San Benito County to adjacent Merced and Stanislaus Counties. This loss of habitat or movement corridors could result in harm to San Joaquin kit fox and hence constitute take. Another potential cause of take is construction of rural roads or increases in rural vehicle traffic along SR 152 that could result in mortality.

One alternative to take is the prohibition of rural development along the SR 152 corridor east of Gilroy. However, this is inconsistent with the County General Plan. Rural development along SR 152 east of Gilroy is expected to occur at very low densities and is not expected to increase substantially during the permit

term due to its distance from public services, large parcel sizes, and strong local tradition of agriculture in the Pacheco Creek valley and ranching in the adjacent hills. As such, threats to kit fox in this area from rural development are relatively low. Because habitat in the study area is not known to be occupied by kit fox, it is legally and practicably infeasible to preclude growth in all areas of unoccupied but suitable habitat for the species, so this alternative was rejected.

An alternative that limits traffic on rural roads within suitable secondary habitat (movement corridors) for San Joaquin kit fox may reduce the incidence of mortality on roads and therefore reduce take in the study area. This alternative was deemed infeasible and rejected because limiting traffic on rural roads is not under the control of the Permittees or the Plan. Furthermore, SR 152 is the only route that crosses from south Santa Clara County to the San Joaquin Valley. Directing traffic to other routes would be infeasible and would divert heavy traffic to other routes, some of which already receive heavy use. This alternative could have severe impacts on traffic elsewhere in the region and could negate the benefits provided to San Joaquin kit fox in the south part of the study area by increasing vehicle mortality of kit foxes elsewhere in its range. It could also increase impacts to Bay checkerspot butterfly by increasing vehicular emissions in the study area from slower traffic. Because San Joaquin kit fox have not been sighted in the study area in recent years, take from vehicular collision is highly unlikely at this time. As described in Chapter 5, there are several wide undercrossings available to kit fox and other species under SR 152 that would already limit the risk of vehicle collisions.

Implementation of this Plan is expected to provide a net benefit to San Joaquin kit fox in the permit area. The study area is outside the core range of the kit fox but is important as a movement route, although that may change with the habitat acquisition and management proposed by the conservation strategy. As such, the corridor study proposed by the Plan as well as actions that enhance key corridor routes are likely to benefit the species.

Up to 278 acres (<1%) of modeled habitat will be affected by covered activities. The Reserve System will acquire and protect an estimated 4,100 acres of modeled secondary habitat. Within the Reserve System all habitat will be enhanced. This will result in an increase of 81% of protected modeled habitat in type 1 open space and a total of 22% of modeled habitat protected in type 1 open space. A network of core reserves and movement routes will protect a critical linkage for San Joaquin kit fox through the study area to adjacent populations in Alameda and Contra Costa Counties. Grassland and oak woodlands will be managed to support a sustainable prey population. Barriers to passage will be removed and structural improvements to facilitate movement will be implemented to improve species passage across SR 152. A public-awareness campaign will encourage species-compatible land uses outside the Reserve System. These and additional management actions (see Chapter 5 *Conservation Strategy*) and conditions on covered activities (see Chapter 6 *Conditions on Covered Activities and Application Process*) are expected to benefit the species in the permit area to a greater degree than any considered alternatives.

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## **13.1 Chapter 1**

### **13.1.1 Printed References**

- California Department of Fish and Game. 2002. *Guidance for the NCCP Independent Science Advisory Process*. August. Available: <<http://www.dfg.ca.gov/nccp/scienceprocess.pdf>>.
- California Department of Fish and Game. 2003. *Mammal, Reptile, Fish, Amphibian, and Bird Species of Special Concern Lists*. May. Available: <<http://www.dfg.ca.gov/hcpb/species/ssc/ssc.shtml>>. Accessed: June 2007.
- California Department of Fish and Game. 2006. *Special Animals List*. February. Available: <<http://www.dfg.ca.gov/bdb/pdfs/spanimals.pdf>>. Accessed: June 2007.
- California Department of Fish and Game. 2007. *Special Vascular Plants, Bryophytes, and Lichens List*. April. Available: <<http://www.dfg.ca.gov/bdb/pdfs/spplants.pdf>>. Accessed: June 2007.
- California Native Plant Society. 2007. *Inventory of Rare and Endangered Plants of California* (7<sup>th</sup> edition). Sacramento, CA. Available: <[www.cnps.org](http://www.cnps.org)>. Accessed: January 2007.
- California Natural Diversity Database. 2008. Occurrence information. RareFind Version 3.1.0 (Updated May, 2008). Sacramento, CA: California Department of Fish and Game.
- City of Gilroy. 2002. *Gilroy General Plan 2002–2020*. Adopted June 13, 2002. Gilroy, CA.
- City of Morgan Hill. 2001. *Morgan Hill General Plan*. Revised July 2006. Morgan Hill, CA.

City of San José, County of Santa Clara, Santa Clara Valley Water District, and Santa Clara Valley Water District. 2004. Memorandum of Understanding by and among the City of San José, the County of Santa Clara, the Santa Clara Valley Water District, and the Santa Clara Valley Water District Regarding Preparation of a Habitat Conservation Plan/Natural Community Conservation Plan and Related Environmental Documents. June.

City of San José. 2011. *Envision San José 2040 General Plan*. San José, CA. Available:  
<[http://www.sanjoseca.gov/planning/gp\\_update/FinalText/ESJ2040GeneralPlan\\_12-1-2011.pdf](http://www.sanjoseca.gov/planning/gp_update/FinalText/ESJ2040GeneralPlan_12-1-2011.pdf)>. Accessed: March 2012.

County of Santa Clara, Parks and Recreation Department. 2003. *Santa Clara County Parks and Recreation System: Strategic Plan*. August 2003. Los Gatos, CA.

County of Santa Clara, Santa Clara Valley Water District, City of Gilroy, City of Morgan Hill, City of San José, Santa Clara Valley Transportation Authority, California Department of Fish and Game, and United States Fish and Wildlife Service. 2005. *Planning Agreement by and among the County of Santa Clara, the Santa Clara Valley Water District, the City of Gilroy, the City of Morgan Hill, the City of San José, the Santa Clara Valley Transportation Authority, the California Department of Fish and Game, and the United States Fish and Wildlife Service Regarding the Santa Clara Valley Natural Community Conservation Plan and Habitat Conservation Plan*. September.

County of Santa Clara. 1994. *Santa Clara County General Plan: Charting a Course for Santa Clara County's Future: 1995–2010*. Adopted December 20, 1994. San José, CA. Available:  
<<http://www.sccgov.org/portal/site/planning/agencychp?path=%2Fv7%2FPlanning%2C%20Office%20of%20%28DEP%29%2FPlans%20%26%20Programs%2FGeneral%20Plan>>. Accessed: July 2010.

County of Santa Clara. 2006. *South County Airport Master Plan Report*. July. San Martin, CA. Prepared by: Mead & Hunt in association with Harris Miller Miller & Hanson Bay Area Economics 3D Visions. Available:  
<[http://www.countyairports.org/new\\_website/forms.html](http://www.countyairports.org/new_website/forms.html)>. Accessed: July 2010.

Goals Project. 1999. Baylands Ecosystem Habitat Goals. A Report of Habitat Recommendations Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, CA, and San Francisco Bay Regional Water Quality Control Board, Oakland, CA.

- RMC Water and Environment, Jones & Stokes. 2006. *Bay Area Integrated Regional Water Management Plan*. November 2006. In Association with: Association of Bay Area Governments, Dan Cloak Environmental Consulting, Greg Bourne, Center for Collaborative Policy, M. Cubed, MIG, San Francisco Estuary Institute, San Francisco Estuary Project. San Francisco, CA.
- San Francisco Estuary Institute. 2006. *Coyote Creek Historical Ecology Study*. Prepared for the Santa Clara Valley Water District. January. Oakland, CA: San Francisco Estuary Institute. 230 pages.
- Santa Clara Valley Transportation Authority. 2009. *Valley Transportation Plan 2035*. January. San José, CA. Available: <http://www.vta.org/studies/vtp2035/index.html>. Accessed: July 2010.
- Santa Clara Valley Water District. 2000. *Flood Protection and Stream Stewardship Program*. San José, CA.
- Santa Clara Valley Water District. 2002a. *Coyote Watershed Stream Stewardship Plan: First Compilation February 2002*. San José, CA: Santa Clara County Water District.
- Santa Clara Valley Water District. 2002b. *Fisheries and Aquatic Habitat Collaborative Effort*. Last Revised: 2002. Available: [http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Taking\\_care\\_of\\_streams/FAHCE/index.shtm](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Taking_care_of_streams/FAHCE/index.shtm). Accessed: January 19, 2006.
- Santa Clara Valley Water District. 2005a. *Reservoirs*. Last revised: 2005. Available: [http://www.valleywater.org/Water/Where\\_Your\\_Water\\_Comes\\_From/Local\\_Water/Reservoirs/index.shtm](http://www.valleywater.org/Water/Where_Your_Water_Comes_From/Local_Water/Reservoirs/index.shtm). Accessed: May 4, 2006.
- Santa Clara Valley Water District. 2005b. *Urban Water Management Plan 2005*. Santa Clara, CA.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. *Habitat Conservation Planning Handbook, as Amended*. November. Amended June 2000. Washington, DC.
- U.S. Fish and Wildlife Service. 2001. *Biological Opinion on the Coyote Valley Research Park and Four Other Related Developments*. Provided to U.S. Army Corps of Engineers, San Francisco District.
- U.S. Fish and Wildlife Service. 2006. Species list for Santa Clara County. Available at: [http://www.fws.gov/sacramento/es/spp\\_lists/auto\\_list\\_form.cfm](http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm). Accessed: January 30, 2006.



## 13.2 Chapter 2

### 13.2.1 Printed References

- Association of Bay Area Governments. 2005. *Projections 2005*. Oakland, CA. As reported by Santa Clara County Planning Office, 2005. Available: <[http://www.sccgov.org/SCC/docs/Planning,%20Office%20of%20\(DEP\)/attachments/884019SCCProjections2005.pdf](http://www.sccgov.org/SCC/docs/Planning,%20Office%20of%20(DEP)/attachments/884019SCCProjections2005.pdf)>.
- Biotic Resources Group. 2001. *Alum Rock Park Riparian Management Plan*. Prepared for the City of San José, Department of Public Works, Parks and Recreation Facilities Division. April 30. 116 pp.
- California Department of Parks and Recreation. 2004. *Home Page*. Available: <<http://www.parks.ca.gov>>. Last revised 2004. Accessed: May 18, 2006.
- City of Gilroy. 2002a. *Gilroy General Plan 2002–2020*. Adopted June 13, 2002. Gilroy, CA.
- City of Gilroy. 2002b. Map of Gilroy 2020 General Plan Land Use Plan. Adopted June 13, 2002. Gilroy, CA.
- City of Gilroy. 2002c. *Bicycle Master Plan*. Gilroy, CA.
- City of Gilroy. 2002d. *Parks and Recreation Systems Master Plan*. Available: <[http://www.ci.gilroy.ca.us/engineering/pdf/pr\\_master\\_plan.pdf](http://www.ci.gilroy.ca.us/engineering/pdf/pr_master_plan.pdf)>. Gilroy, CA.
- City of Gilroy. 2004a. *City of Gilroy Sanitary Sewer Master Plan*. Available: <<http://www.ci.gilroy.ca.us/engineering/pdf/Sewer.pdf>>. Gilroy, CA.
- City of Gilroy. 2004b. *City of Gilroy Storm Drain Master Plan*. Available: <<http://www.ci.gilroy.ca.us/engineering/pdf/Storm.pdf>>. Gilroy, CA.
- City of Gilroy. 2004c. *City of Gilroy Traffic Master Plan*. Gilroy, CA.
- City of Gilroy. 2004d. *City of Gilroy Water Master Plan*. Available: <<http://www.ci.gilroy.ca.us/engineering/pdf/Water.pdf>>. Gilroy, CA.
- City of Gilroy. 2005a. *Glen Loma Ranch Specific Plan*. Gilroy, CA.
- City of Gilroy. 2005b. *Draft Hecker Pass Specific Plan*. Gilroy, CA.
- City of Gilroy. 2005c. *Trails Master Plan*. Approved May 2, 2005. Available: <<http://www.ci.gilroy.ca.us/engineering/pdf/GilroyTrailsMasterPlan.pdf>>. Gilroy, CA.
- City of Gilroy. 2006a. *Gilroy at a Glance*. Available: <<http://www.ci.gilroy.ca.us/living/demography.html>>. Accessed: February 28, 2006.

- City of Gilroy. 2006b. City of Gilroy Wastewater Treatment Plant Master Plan. Gilroy, CA.
- City of Morgan Hill. 2001a. Map of General Plan Land Use Diagram. Adopted July 25, 2001. Revised April 4, 2005. Morgan Hill, CA.
- City of Morgan Hill. 2001b. *Morgan Hill General Plan*. Adopted July 2001. Revised July 2006. Morgan Hill, CA.
- City of Morgan Hill. 2001c. *Parks, Facilities & Recreation Programming Master Plan*. Available: <[http://www.morganhill.ca.gov/html/DocCenter.asp?category\\_id=240000016](http://www.morganhill.ca.gov/html/DocCenter.asp?category_id=240000016)>. Accessed: June 20, 2006. Morgan Hill, CA.
- City of Morgan Hill. 2002a. Capital Improvement Program. Morgan Hill, CA.
- City of Morgan Hill. 2002b. *Sewer System Master Plan*. Available: <[http://www.morganhill.ca.gov/html/DocCenter.asp?category\\_id=240000262](http://www.morganhill.ca.gov/html/DocCenter.asp?category_id=240000262)>. Morgan Hill, CA.
- City of Morgan Hill. 2002c. *Storm Drainage System Master Plan*. Available: <[http://www.morganhill.ca.gov/html/DocCenter.asp?category\\_id=240000263](http://www.morganhill.ca.gov/html/DocCenter.asp?category_id=240000263)>. Morgan Hill, CA.
- City of Morgan Hill. 2002d. *Water Master Plan*. Morgan Hill, CA.
- City of Morgan Hill. 2004. *City of Morgan Hill Redevelopment Agency Implementation Plan*. Morgan Hill, CA.
- City of Morgan Hill. 2003. Citywide Burrowing Owl Habitat Mitigation Plan. June. Morgan Hill, CA.
- City of Morgan Hill. 2006. *About Morgan Hill*. Available: <<http://www.morganhill.ca.gov/html/about/index.asp>>. Accessed: February 28, 2006.
- City of Morgan Hill. 2007. *Environmental Programs*. Morgan Hill, CA.
- City of Morgan Hill. 2008. *Bikeways Master Plan Update*. A Bicycle Transportation Plan for the City of Morgan Hill. May. Prepared by: Bellinger Foster Steinmetz Landscape Architecture. Available: <<http://www.morganhill.ca.gov/DocumentView.aspx?DID=2718>>. Accessed: June 2012. Morgan Hill, CA.
- City of Morgan Hill. 2009. *Morgan Hill Downtown Specific Plan*. Adopted: November 4, 2009. Available: <<http://www.morganhill.ca.gov/index.aspx?NID=668>>. Accessed: June 2012.
- City of San José. 1983. Kirby Canyon Sanitary Landfill Draft Environmental Impact Report (SCH 83052408). July 15. City of San José Planning Department San José, California.

City of San José. 1984. "Planned Development (PD) Permit (File No. PD 84-5-55) for the Planned Development District, or Portion Thereof, Established by Ordinance No. 25122 of the City of San José for the Property Situated on the East Side of Future 101 Between Scheller and Burnett Avenues." City of San José Planning Department, San José, California.

City of San José. 2000. *Greenprint for Parks and Community Facilities and Programs*. San José, CA.

City of San José. 2004. *City of San José Sanitary Sewer Master Plan*. San José, CA.

City of San José. 2006a. Map of Land Use/Transportation Diagram: San José 2020 General Plan. San José, CA.

City of San José. 2006b. *Storm Sewer System Capital Program: 2007–2011 Proposed Capital Improvement Program*. Available:  
<<http://www.sanjoseca.gov/budget/FY0607/ProposedCapital/34.pdf>>. Accessed: May 31, 2006.

City of San José. 2006c. *Sanitary Sewer System Capital Program: 2007–2001 Proposed Capital Improvement Program*. Available:  
<<http://www.sanjoseca.gov/budget/FY0607/ProposedCapital/34.pdf>>. Accessed: May 31, 2006.

City of San José. 2011. *Envision San José 2040 General Plan*. San José, CA. Available:  
<[http://www.sanjoseca.gov/planning/gp\\_update/FinalText/ESJ2040GeneralPlan\\_12-1-2011.pdf](http://www.sanjoseca.gov/planning/gp_update/FinalText/ESJ2040GeneralPlan_12-1-2011.pdf)>. Accessed: March 2012.

County of Santa Clara, Division of Agriculture. 2005. *Santa Clara County Agricultural Crop Reports 2004*. Available:  
<<http://www.sccgov.org/SCC/docs%2FAgriculture%2C%20Division%20of%20%28DIV%29%2FAttachments%2FCropReport2004final.pdf>>. Accessed: May 1, 2006.

County of Santa Clara, Parks and Recreation Department 2006a [Table 2-2]

County of Santa Clara, Parks and Recreation Department 2006b [Table 2-2]

County of Santa Clara, Parks and Recreation Department. 2011. Calero County Park Trails Master Plan Program Development Report (Draft). March. Available:  
<<http://www.sccgov.org/sites/parks/Future%20Plans%20Here/Documents/TrailPlanProgramDevReport.pdf>>. Accessed: June 22, 2012.

County of Santa Clara, Parks and Recreation Department. 1995. *Countywide Trails Master Plan Update*. November 14. Los Gatos, CA.

- County of Santa Clara, Parks and Recreation Department. 2003. Santa Clara County Parks and Recreation System: Strategic Plan. August 2003. Los Gatos, CA. p. 144.
- County of Santa Clara, Parks and Recreation Department. 2004. Natural Resource Management Plan: Coyote Lake—Harvey Bear Ranch County Park. January. Prepared by Rana Creek Habitat Restoration. p. 110.
- County of Santa Clara, Parks and Recreation Department. 2006a. *Coyote Creek Parkway County Park Integrated Natural Resources Management Plan and Master Plan, Draft*. Prepared by 2M Associates, Jones & Stokes Associates, Balance Hydrologics, Inc., and Harison & Associates. Adopted: March 7, 2007. Available:  
<<http://www.parkhere.org/SCC/docs%2FParks%20and%20Recreation%2C%20Department%20of%20%28DEP%29%2Fattachments%2FDraftIntegratedPlanReport.pdf>>.
- County of Santa Clara, Parks and Recreation Department. 2006b. *Find a Park*. Available:  
<<http://www.parkhere.org/portal/site/parks/menuitem.8dc420adbdbdce85dbc2bd4735cda429/?path=%2Fv7%2FParks%20and%20Recreation%2C%20Department%20of%20%28DEP%29%2FFind%20a%20Park>>. Accessed: July 2006.
- County of Santa Clara, Parks and Recreation Department. 2008. *Find a Park*. Available:  
<<http://www.sccgov.org/portal/site/parks/parkschp?path=%2Fv7%2FParks%20and%20Recreation%2C%20Department%20of%20%28DEP%29%2FFind%20a%20Park>>. Accessed: November 10, 2008.
- County of Santa Clara, Parks and Recreation Department. 2012. *Find a Park*. Available: <<http://www.sccgov.org/sites/parks/Ride%20Here/Pages/Calero-County-Park.aspx>>. Accessed: April 2012.
- County of Santa Clara. 1994. *Santa Clara County General Plan: Charting a Course for Santa Clara County's Future: 1995–2010*. Adopted December 20, 1994. San José, CA.
- County of Santa Clara. 2006a. *About the County*. Available:  
<<http://www.sccgov.org/portal/site/scc/menuitem.2c9f27538b48f388dfe093102830a429/?path=%2Fv7%2FSCC%20Public%20Portal%2FCounty%20Connection%2FAbout%20the%20County>>. Accessed: February 27, 2006.
- County of Santa Clara. 2006b. *Planning Office: County Profile*. Available:  
<[http://www.sccgov.org/portal/site/planning/menuitem.244564f66e6d425580b558bb35cda429/?path=%2Fv7%2FPlanning%2C%20Office%20of%20\(DEP\)%2FFacts%20%26%20Figures%2FCounty%20Profile](http://www.sccgov.org/portal/site/planning/menuitem.244564f66e6d425580b558bb35cda429/?path=%2Fv7%2FPlanning%2C%20Office%20of%20(DEP)%2FFacts%20%26%20Figures%2FCounty%20Profile)>. Accessed: March 17, 2006.

- County of Santa Clara. 2006c. *South County Airport Master Plan Report: Public Review Draft*. July. San Martin, CA. Available: <http://www.countyairports.org/documents.htm>. Accessed: January 18, 2006.
- Hays, D. W., K. R. McAllister, S. A. Richardson, and D. W. Stinson. 1999. Draft Washington State recovery plan for the western pond turtle. Wash. Dept. Fish and Wild., Olympia, Wash. 53 pp.
- Live Oak Associates. 2006. Annual Report on the Morgan Hill Citywide Burrowing Owl Habitat Mitigation Plan. Prepared for City of Morgan Hill. October 23.
- Metropolitan Transportation Commission. 2005. *Mobility for the Next Generation: Transportation 2030 Plan for the San Francisco Bay Area*. Appendix One—Projects by County. Oakland, CA.
- National Marine Fisheries Service, California Department of Fish and Game, Streams for Tomorrow, San Jose State University, and Santa Clara Valley Water District. 2009. *DRAFT Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds*. January 20.
- Rana Creek Habitat Restoration. 2004. *Coyote Lake-Harvey Bear Ranch County Park Natural Resource Management Plan*. January. Prepared for the Santa Clara County Parks & Recreation Department.
- Santa Clara County Open Space Authority. 2005. *Home Page*. Available: <http://www.openspaceauthority.org>. Last revised 2005. Accessed: January 13, 2006.
- Santa Clara County Open Space Authority. 2010. *Rancho Cañada del Oro*. Available: <http://www.openspaceauthority.org/trails/rancho.html>. Accessed: June 4, 2010.
- Santa Clara Valley Transportation Authority. 2006. *Inside VTA: Vision, Mission, and Goals*. Available: <http://www.vta.org/inside/about/vision.html>. Accessed: March 17, 2006.
- Santa Clara Valley Transportation Authority. 2008. *South County Circulation Study Final Report*. April 2008. Prepared by URS Corporation for the Santa Clara Valley Transportation Authority. San José, CA.
- Santa Clara Valley Transportation Authority. 2009. *Valley Transportation Plan 2035*. January. San José, CA. Available: <http://www.vta.org/studies/vtp2035/index.html>. Accessed: July 2010.
- Santa Clara Valley Water District and South County Regional Wastewater Authority. 2004. *South County Recycled Water Master Plan*. October. Walnut Creek, CA. Prepared by Carollo Engineers. Available: <http://www.ci.gilroy.ca.us/engineering/pdf/SouthCountyRecWatMP.pdf>.

- Santa Clara Valley Water District. 1999. *Guadalupe River Watershed Planning Study Engineering Report, Project No. 3015*. San José, CA: Santa Clara County Water District.
- Santa Clara Valley Water District. 2000. A 15-year plan to preserve and protect our quality of life, Clean, Safe Creeks and Natural Flood Protection. San José, CA: Santa Clara County Water District.
- Santa Clara Valley Water District. 2002. Coyote Watershed Stream Stewardship Plan: First Compilation February 2002. San José, CA: Santa Clara County Water District.
- Santa Clara Valley Water District. 2005. *Reservoirs*. Available: <[http://www.scvwd.dst.ca.us/water/Where\\_Your\\_Water\\_Comes\\_From/Local\\_Water/Reservoirs/index.shtm](http://www.scvwd.dst.ca.us/water/Where_Your_Water_Comes_From/Local_Water/Reservoirs/index.shtm)>. Accessed: March 24, 2009.
- Santa Clara Valley Water District. 2006. *About Us: Santa Clara County Water District*. Available: <[http://www.valleywater.org/About\\_Us/index.shtm](http://www.valleywater.org/About_Us/index.shtm)>. Accessed: March 17, 2006.
- Santa Clara Valley Water District. 2007a. *Pipeline Maintenance Program*. September. Prepared by MHA Environmental Consulting, Inc. San Mateo, CA.
- Santa Clara Valley Water District. 2007b. *Pipeline Maintenance Program Final Program Environmental Impact Report*. September. Prepared by MHA Environmental Consulting, Inc. San Mateo, CA.
- Santa Clara Valley Water District. 2007c. Status Report: Federal Projects for Santa Clara County, California, Fiscal Year 2007. San José, CA: Santa Clara Valley Water District.
- Silicon Valley Land Conservancy 2006 [Table 2-2]
- Silicon Valley Land Conservancy. 2006. *Organizations*. Available: <<http://www.siliconvalleylc.org>>. Accessed: May 17, 2006.
- Sustainable Agricultural Education (SAGE) and Economic and Planning Systems (EPS). 2007. *Martial Cottle Park Master Plan Case Study Report*. October 25. Available: <[http://www.sccgov.org/SCC/docs/Parks%20and%20Recreation,%20Department%20of%20\(DEP\)/attachments/CaseStudies\\_FINAL\\_20071029.pdf](http://www.sccgov.org/SCC/docs/Parks%20and%20Recreation,%20Department%20of%20(DEP)/attachments/CaseStudies_FINAL_20071029.pdf)>. Accessed: May 22, 2009.
- The Nature Conservancy. 2006. *California's Mount Hamilton Project*. Available: <<http://www.nature.org/success/mthamilton.html>>. Accessed: February 20, 2006.
- Thomas Reid Associates. 2003. Biological Assessment for the California Red-Legged Frog and Other Species at the Kirby Canyon Recycling and Disposal Facility, San José, California. April 2003. San José, California.

- U.S. Census Bureau. 2006. *San Martin CDP, California*. Available: [http://factfinder.census.gov/servlet/SAFFPopulation?\\_event=Search&\\_name=San+Martin&\\_state=04000US06&\\_county=San+Martin&\\_cityTown=San+Martin&\\_zip=&\\_sse=on&\\_lang=en&pctxt=fph](http://factfinder.census.gov/servlet/SAFFPopulation?_event=Search&_name=San+Martin&_state=04000US06&_county=San+Martin&_cityTown=San+Martin&_zip=&_sse=on&_lang=en&pctxt=fph)>. Accessed: June 22, 2006.
- U.S. Department of Agriculture. 1982. *Final Environmental Impact Statement/Report, Llagas Creek Watershed Santa Clara County, California*. Davis, CA: Soil Conservation Service.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*. Final. March. Available: [http://www.nmfs.noaa.gov/pr/pdfs/laws/esa\\_section7\\_handbook.pdf](http://www.nmfs.noaa.gov/pr/pdfs/laws/esa_section7_handbook.pdf)>. Accessed: July 29, 2010.
- U.S. Fish and Wildlife Service. 1997. Formal Consultation on the Kirby Canyon Recycling and Disposal Facility, Santa Clara County, California (Public Notice No. 19463S). March 12. Reference number 1-1-97-F-5.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.
- U.S. Fish and Wildlife Service. 2003. Formal Endangered Species Consultation on the Proposed Kirby Canyon Recycling and Disposal Facility, Santa Clara County, California (Corps File #27837S ). San Francisco, CA. File Number 1-1-03-F-0231. July 9.
- U.S. Fish and Wildlife Service. 2005. Reinitiation of Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the Central Valley Project and State Water Project and the Operations Criteria and Plan to Address Potential Critical Habitat Issues – February 15, 2005. Sacramento, CA. File Number 1-1-05-F-0055.
- Waste Management. 2008. *Community: Kirby Canyon Recycling & Disposal*. Available: <http://www.wm.com/wm/community/whc/whc.asp>>. Accessed: February 25, 2009.

## 13.2.2 Personal Communications

- Aggarwal, Ranu. Planner III. County of Santa Clara, San José, CA. December 4, 2007—memo to Ken Schrieber, County of Santa Clara.
- Arnold, Don. Santa Clara Valley Water District, San José, CA. May 18, 2009—e-mail exchanged with Kathryn Gaffney, ICF Jones & Stokes.
- Barclay, Jack. Principal and senior wildlife biologist. Albion Environmental, Santa Cruz, CA. January, February 2007—meetings with Jones & Stokes staff.

- Caldon, Debra. Environmental Planning Unit Manager. Santa Clara Valley Water District, San José, CA. March 2, 2012—email exchange with Kathryn Gaffney, ICF Jones & Stokes.
- Cameron, Dawn (a). Consulting Transportation Planner. County of Santa Clara Roads and Airports Department. San José, CA. February 1, 2009—e-mail with Kathryn Gaffney, ICF Jones & Stokes.
- Cameron, Dawn (b). Consulting Transportation Planner. County of Santa Clara Roads and Airports Department. September 30, 2009—e-mail with Kathryn Gaffney, ICF Jones & Stokes.
- Casper, Cydney. City of Gilroy, CA. March 14, 2006—e-mail exchange with Kathryn Gaffney, Jones & Stokes.
- Faus, William C. Planning Division Manager. City of Gilroy, CA. October, 29, 2007—e-mail exchange with Kathryn Gaffney, Jones & Stokes.
- Golden, Steve. Associate planner. City of Morgan Hill, CA. March 17, 2006—e-mail exchange with Kathryn Gaffney, Jones & Stokes.
- Honaker Carl. Director. Santa Clara County Airports. July 18, 2008—e-mail with Kathryn Gaffney, ICF Jones & Stokes.
- Mark, Jane F. Senior Planner. County of Santa Clara, Parks and Recreation Department. July 9, 2011—email to Kathryn Gaffney of ICF.
- Mena, Mike. Planner II. City of San José, CA. March 14, 2006—e-mail exchange with Kathryn Gaffney, Jones & Stokes.
- Palcovik, Amy. Resource ecologist. California Department of Parks and Recreation, Monterey District. May 25, 2006—meeting with Kathryn Gaffney, Jones & Stokes.
- Rocha, Don. 2011. Natural Resource Program Supervisor. Santa Clara County Parks. Los Gatos, CA. July, 19, 2011—email exchange with Kathryn Gaffney, ICF International.
- Showalter, Pat. 2006. Senior project manager. Santa Clara Valley Water District, San José, CA. March 14, 2006—meeting with Kathryn Gaffney, Jones & Stokes.
- Showalter, Pat. Senior project manager. Santa Clara Valley Water District, San José, CA. March 5, 2008—e-mail exchange with Kathryn Gaffney, ICF Jones & Stokes.
- Showalter, Pat. Senior project manager. Santa Clara Valley Water District, San José, CA. May 6, 2010—e-mail exchange with Kathryn Gaffney, ICF International.



## 13.3 Chapter 3

### 13.3.1 Printed References

- Allen, V. G., C. Batello, E.J. Barretta, J. Hodgson, M. Kothmann, X. Li, J. McIvor, J. Milne, C. Morris, A. Peeters and M. Sanderson. 2011. An international terminology for grazing lands and grazing animals. *Grass and Forage Science*. 66: 2-28.
- Allen-Diaz, B., J.W. Bartolome, and M.P. McClaran. 1999. California oak savanna. Pages 322–339 in R.C. Anderson, J.S. Fralish, and J.M. Baskin (eds.), *Savannas, Barrens, and Rock Outcrop Plant Communities of North America*. New York, NY: Cambridge University Press.
- Alt, D., and D.W. Hyndman. 2000. *Roadside Geology of Northern and Central California*. Missoula, MT: Mountain Press Publishing Company.
- Anderson, L.W., M.H. Anders, and D.A. Ostenaa. 1982. Late Quaternary Faulting and Seismic Hazard Potential, Eastern Diablo Range, California. Pages 197–206 in E. W. Hart, S. E. Hirschfeld, and S. S. Schulz (eds.), *Proceedings, Conference on Earthquake Hazards in the Eastern San Francisco Bay Area*. (Special Publication 62.) Sacramento, CA: California Division of Mines and Geology.
- Baker, G.A., P.W. Rundel, and D.J. Parsons. 1981. Ecological relationships of *Quercus douglasii* (Fagaceae) in the foothill zone of Sequoia National Park, California. *Madroño* 28:1–12.
- Barbour, M., J. Burk, and W. Pitts. 1993. *California's Changing Landscapes: Diversity and Conservation of California Vegetation*. Sacramento, CA: California Native Plant Society.
- Bartolome, J.W. 2011. "Grazing Management for Native Grasses-A Research Review" Presentation to the Central Coast Rangeland Coalition, Vaquero Farms, October 20, 2011.
- Bartolome, J.W. W.J. Barry, T. Griggs, and P.Hopkinson. 2007. Valley grassland. Pp. 367-393 in: M.G.Barbour, T. Keeler-Wolf, and A. Schoenherr (Eds.) *Terrestrial Vegetation of California*, Third Ed. Berkeley: University of California Press.
- Bartolome, J.W., M.P. McClaren, B.H. Allen-Diaz, J. Dunne, L.D. Ford, R.B. Standiford, N.K. McDougald, and L.C. Forero. 2002. Effects of Fire and Browsing on Regeneration of Blue Oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*, October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.

- Blumler, M.A. 1992. Some Myths about California Grasslands and Grazers. *Madroño* 20:22–27.
- Bolton, H.E. 1927. Fray Juan Crespi, Missionary Explorer on the Pacific Coast, 1769–1774. Berkeley, CA: University of California Press.
- Bolton, H.E. 1930. Opening a Land Route to California: Diaries of Anza, Diaz, Garces and Palou. Vol. II of Anza's California Expeditions. Berkeley, CA: University of California Press.
- Borchert, M.I., F.W. Davis, J. Michaelson, and L.D. Oyler. 1989. Interactions of Factors Affecting Seedling Recruitment of Blue Oak (*Quercus douglasii*) in California. *Ecology* 70:389–404.
- Bousman, W.G. 2005. A checklist of the birds of Santa Clara County. Santa Clara Valley Audubon Society. Available: <<http://www.scvas.org/pdf/checklist.pdf>>.
- Brabb, E.E., and Dibblee, T.W. 1974. Geologic Map, Santa Clara County, California. California Division of Mines and Geology. Scale 1:62,500.
- CalFlora Database. 2006. On-line database of California floristic information. <<http://www.calflora.org/>>. Berkeley, CA. Accessed May, 2006.
- California Bird Records Committee. 2008. *Official California Bird Lists*. Available: <<http://www.californiabirds.org/list.html>>. Accessed: August 2008.
- California Department of Fish and Game. 1998. *California Vernal Pool Assessment Preliminary Report*. Sacramento, CA: Wildlife and Habitat Data Analysis Branch.
- California Department of Fish and Game. 2003a. List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database. September 6 edition.
- California Department of Fish and Game. 2003b. *Atlas of the Biodiversity of California*. October. By Kevin Hunting. Sacramento, CA.
- California Department of Fish and Game. 2007. Vegetation Classification and Mapping Program List of California Vegetation Alliances. October 22 edition.
- California Department of Forestry and Fire Protection. 1992. Valley oak: historical range data. Fire and Resource Assessment Program (FRAP). Available: <<http://frap.cdf.ca.gov/data/frapgisdata/select.asp>>.

- California Department of Water Resources. 2004. *Santa Clara Valley Groundwater Basin, Santa Clara Subbasin*. (California's Groundwater Bulletin 118.) Last updated: February 27, 2004. Available: <[http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs\\_desc/2-9.02.pdf](http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/2-9.02.pdf)>. Accessed: June 2006.
- California Department of Water Resources. 2006. California Data Exchange Center. Coyote CR NR Madrone (CYO). Available: <[http://cdec.water.ca.gov/cgi-progs/selectQuery?station\\_id=cyo&sensor\\_num=&dur\\_code=M&start\\_date=01%2F01%2F1901&end\\_date=now](http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=cyo&sensor_num=&dur_code=M&start_date=01%2F01%2F1901&end_date=now)>. Accessed: September 13, 2006.
- California Interagency Watershed Mapping Committee. 1999. *California Interagency Watershed Map of 1999 (CalWater 2.2.1)*. Available: <<http://gis.ca.gov/meta.epl?oid=22175>>.
- California Native Plant Society. 2001. *Inventory of Rare and Endangered Plants of California* (6<sup>th</sup> edition). David Tibor, editor. Sacramento, CA: California Native Plant Society.
- California Native Plant Society. 2003. *Relevé Protocol CNPS Vegetation Committee*. Revised: February 5, 2003. Available: <<http://www.cnps.org/archives/forms/releve.pdf>>.
- California Native Plant Society. 2007. *Inventory of Rare and Endangered Plants of California* (7<sup>th</sup> edition). Sacramento, CA. On-line database Available: <[www.cnps.org](http://www.cnps.org)>.
- California Natural Diversity Database. 2008. Occurrence information. RareFind Version 3.1.0 (Updated May, 2008). Sacramento, CA: California Department of Fish and Game.
- California Natural Diversity Database. 2012. Occurrence information. RareFind, Version 3.1.0 (Updated April 2012). Sacramento, CA: California Department of Fish and Game.
- California Partners in Flight. 2004. Version 2.0. The Coastal Scrub and Chaparral Bird Conservation Plan: A Strategy for Protecting and Managing Coastal Scrub and Chaparral Habitats and Associated Birds in California. (J. Lovio, lead author). Stinson Beach, CA: Point Reyes Bird Observatory (PRBO) Conservation Science. Available: <<http://www.prbo.org/calpif/plans.html>>.
- California Spatial Information Library. 1997. *Geographic Names*. Data available: <<http://gis.ca.gov/casil/gis.ca.gov/teale/geonamea/>>.
- City of San José. 2004. City of San José Sanitary Sewer Master Plan. San José, CA.
- City of San José. 2005. *San José 2020 General Plan*. San José, CA.

- City of San José. 2007. *Coyote Valley Specific Plan Draft Environmental Impact Report*. March. Available:  
[http://www.sanjoseca.gov/coyotevalley/publications\\_DEIR.htm](http://www.sanjoseca.gov/coyotevalley/publications_DEIR.htm).  
 Accessed: April 2007.
- County of Santa Clara, Department of Agriculture. 2004. *Santa Clara County Agricultural Crop Report 2004*. Available:  
<http://www.sccgov.org/SCC/docs%2FAgriculture%2C%20Division%20of%20%28DIV%29%2FAttachments%2FCropReport2004final.pdf>. Accessed:  
 May 1, 2006.
- County of Santa Clara, Parks and Recreation Department. 2004. *Natural Resource Management Plan: Coyote Lake—Harvey Bear Ranch County Park*. Prepared by Rana Creek Habitat Restoration. January. pp. 110.
- County of Santa Clara, Planning Department. 1969. Engineering Geology Study of Part of the Santa Cruz Mountains.
- County of Santa Clara. 2005. *An Oak Woodlands Management Plan for Santa Clara County*. February. Prepared for Santa Clara County Planning Department.
- Cowling, R.M. et al. 2008. An operational model for mainstreaming ecosystem services for implementation. Proceedings of the National Academy of Sciences of the USA. 105:28:9483-9488.
- D'Antonio, C.M., C.Malmstrom, S.A. Reynolds, and Gerlach, 2007. Ecology of invasive non-native species in California grassland. Pp. 67-83 in: M.R. Stromberg, J.D. Corbin, and C.M. D'Antonio (Eds.) California grasslands: ecology and management. Berkeley: University of California Press.
- Daily, G. 2011. *Ecosystem Services as a Tool for Conservation*. Presentation at the symposium California Rangelands, a Woods Institute Uncommon Dialogue, Stanford University, May 13, 2011.
- Daily, G.C. and P.A. Matson. 2008. *Ecosystem services: From theory to implementation*. Proceedings of the National Academy of Sciences of the USA 105:28:9455-9456.
- Davis, S.D., V.H. Heywood, O. Herrera-MacBryde, J. Villa-Lobos, and A.C. Hamilton (eds.). 1997. *Centres of Plant Diversity: A Guide and Strategy for their Conservation*. Volume 3: *The Americas*. Cambridge, UK: The World Wildlife Fund for Nature and IUCN-the World Conservation Union.
- Dibblee, T.W. 1973. Preliminary Geologic Map of the the Mt. Madonna Quadrangle, Santa Clara and Santa Cruz Counties, California. (U.S. Geological Survey Open-File Report [OF-73-59]). Scale 1:24,000.
- Dibblee, T.W. 1977. Preliminary Map of Santa Clara Valley Serpentes [unpublished]. Scale 1:50,000. Also dated 1972, 1973.

- Dickman, C. R. 1987. Habitat utilization and diet of the harvest mouse, *Micromys minutus*, in an urban environment. *Acta Theriologica* 31:249–56.
- Dyer, A.R., H.C. Fossum, and J.W. Menke. 1996. Emergence and survival of *Nassella pulchra* in California grassland. *Madrono* 43(2):316–333.
- Edwards, S. W. 1992. Observations on the prehistory and ecology of grazing in California. *Fremontia* 20(1):3–11.
- Elith, J., C.H. Graham, R.P. Anderson, M. Dudík, S. Ferrier, A. Guisan, R.J. Hijmans, F. Huettmann, J.R. Leathwick, A. Lehmann, J. Li, L.G. Lohmann, B.A. Loiselle, G. Manion, C. Moritz, M. Nakamura, Y. Nakazawa, J. McC. M. Overton, A.T. Peterson, S.J. Phillips, K. Richardson, R. Scachetti-Pereira, R.E. Schapire, J. Soberón, S. Williams, M.S. Wisz, and N.E. Zimmermann. 2006. Novel methods improve prediction of species' distributions from occurrence data. *Ecography* 29:129–151.
- Evarts, R.C., R.G. Coleman, and P. Schiffman. 1999. The Del Puerto ophiolite: petrology and tectonic setting. Pages 136–149 in D. L. Wagner and S. A. Graham (eds.), *Geologic Field Trips in Northern California, Centennial Meeting of the Cordilleran Section of the Geological Society of America*. (Special Publication 119.) Sacramento, CA: California Division of Mines and Geology.
- Evens, J., and S. San. 2004. Vegetation Associations of a Serpentine Area: Coyote Ridge, Santa Clara County, California. Sacramento, CA: California Native Plant Society.
- Faber, Phyllis M. 1982. *Common Wetland Plants of Coastal California*. Mill Valley, CA: Pickleweed Press.
- Ford, L.D. and G.F. Hayes. 2007. Northern Coastal Scrub and Coastal Prairie. Pp. 180–207 in: M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr (Eds.) *Terrestrial Vegetation of California*, Third Ed. Berkeley: University of California Press.
- Gelfand, A.E., J.A. J. Silander, S. Wu, A. Latimer, P.O. Lewis, A.G. Rebelo, and M. Holder. 2006. Explaining species distribution patterns through hierarchical modeling. *Bayesian Analysis* 1(1):41–92.
- Gilbert, O.L. 1989. *The Ecology of Urban Habitats*. New York: Chapman and Hall.
- Giusti, G.A., R.B. Standiford, D.D. McCreary, A. Merenlender, and T. Scott. 2004. *Oak Woodland Conservation in California's Changing Landscape*. University of California, Integrated Hardwood Range Management Program, Division of Agriculture and Natural Resources and University of California, Berkeley.

- Greenlee, J.M., and J.H. Langenheim. 1990. Historic fire regimes and their relation to vegetation patterns in the Monterey Bay area of California. *American Midland Naturalist* 124:239–253.
- Grenfell, W.E., Jr. 1988. Valley foothill riparian. Pages 86–87 in K. E. Mayer and W. F. Laudenslayer, Jr. (eds.), *A Guide to Wildlife Habitat of California*. Sacramento, CA: State of California Resources Agency, Department of Fish and Game.
- Griffin, J.R. 1971. Oak regeneration in the upper Carmel Valley, California. *Ecology* 52:862–868.
- Griffin, J.R. 1973. Xylem Sap Tension in Three Woodland Oaks of Central California. *Ecology* 54:152–159.
- Griffin, J.R. 1977. Oak Woodland. Pages 383–415 in M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. New York: Wiley and Sons.
- Grossinger, R.M., R.A. Aaskevold, C.J. Striplen, E. Brewster, S. Pearce, K.N. Larned, L.J. McKee, and J.N. Collins. 2006. Coyote Creek Watershed Historical Ecology Study: Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California. (SFEI Publication 426.) San Francisco Estuary Institute, Oakland, CA. Prepared for the Santa Clara Valley Water District.
- Guisan, A., and W. Thuiller. 2005. Reviews and syntheses: predicting species distribution: offering more than simple habitat models. *Ecology Letters* 8(9):993–1009.
- Guisan, A., O. Broennimann, R. Engler, M. Vust, N. Yoccoz, A. Lehmann, and N. Zimmermann. 2006. Using niche-based models to improve the sampling of rare species. *Conservation Biology* 20(2):501–511.
- H.T. Harvey & Associates. 1999. *Santa Clara Valley Water District Foothill Yellow-Legged Frog Distribution and Status-1999*. Prepared for Santa Clara Valley Water District, San José, CA.
- H.T. Harvey & Associates. 2006. *Castro Valley Ranch Environmental Impact Report*. Biotic Resources Section. Prepared for David J. Powers & Associates. September 6.
- Hamilton, C. L., and H. G. Jepson. 1940. Stock water development. Farmers Bulletin No. 1859. Washington D.C.: USDA.
- Hanes, T.L. 1988. California chaparral. Pages 417–469 in M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. Sacramento, CA: California Native Plant Society.
- Harrison, S. 1999. Local and regional diversity in a patchy landscape: native, alien and endemic herbs on serpentine soils. *Ecology* 80:70–80.

- Harrison, S., B.D. Inouye, and H.D. Safford. 2003. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. *Conservation Biology* 17(3):837–845.
- Harrison, S.P. and J.H. Viers. 2007. Serpentine grasslands. Pp. 145-155, in: M.R. Stromberg, J.D. Corbins, and C.M. D’Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- Hart, E.W., and W.A. Bryant. 1997. Fault-Rupture Hazard Zones in California—Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps. (Special Publication 42.) Sacramento, CA: California Division of Mines and Geology.
- Hatch, D.A., J.W. Bartolome, J.S. Fehmi, and D.S. Hillyard. 1999. Effects of burning and grazing on a coastal grassland. *Restoration Ecology* 7(4):376-381.
- Hayes, G. and K.D. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition of mesic grasslands in California. *Conservation Biology* 17:1694-1702.
- Hayes and Holl. 2011. Manipulating disturbance regimes and seeding to restore mesic Mediterranean grasslands. *Applied Vegetation Science*, 14: 304–315.
- Heady, H.F. 1988. Valley grassland. Pages 491–514 in M.G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. Sacramento, CA: California Native Plant Society.
- Heady, H.F., T.C. Foin, M.M. Hektner, D.W. Taylor, M.G. Barbour, and W.J. Barry. 1988. Coastal prairie and northern coastal scrub. Pages 733–760 in M.G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. Sacramento, CA: California Native Plant Society.
- Helley, E.J., R.W. Graymer, G.A. Phelps, P.K. Showalter, and C.M. Wentworth. 1994. Preliminary Quaternary Geologic Maps of Santa Clara Valley, Santa Clara, Alameda, and San Mateo Counties, California: A Digital Database. U.S. Geological Survey Open-File Report 94-231. Available at: <<http://pubs.usgs.gov/of/1994/of94-231/>>.
- Henry, G.W. 1931. The adobe brick as a historical source. *Agricultural History*. 5:110-127.
- Hickman, J.C. (ed.). 1993. *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Hilty, J., and A.M. Merelender. 2004. Use of riparian corridors and vineyards by mammalian predators in Northern California. *Conservation Biology* 18:126–135.

- Hirzel, A.H., and R. Arlettaz. 2003. Modeling habitat suitability for complex species distributions by environmental-distance geometric mean. *Environmental Management* 32(5):614–623.
- Hirzel, A.H., J. Hausser, D. Chessel, and N. Perrin. 2002. Ecological-niche factor analysis: how to compute habitat-suitability maps without absence data? *Ecology* 83(7):2027–2036.
- Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. October. Sacramento, CA: California Department of Fish and Game.
- Holland, V.L., and D.J. Keil. 1995. *California Vegetation*. Dubuque, IA: Kendall/Hunt Publishing Company. 516 pages.
- Hopkinson, P. and Huntsinger, L. 2005. Are East Bay hills grasslands a historical artifact? Phytolith evidence and a potential candidate for the true East Bay vegetation type. *Grasslands* 15(1): 7-9.
- Horii, R. 2004. *The Coyote Alamitos Canal*. Available: <<http://www.geocities.com/santateresahills/C-ACanal.htm>>. Updated: March 29, 2004. Accessed: May 2006.
- Howard, J. L. 1998. *Bromus hordeaceus*. Available: <<http://www.fs.fed.us/database/feis/plants/graminoid/brohor/all.html#FIRE%20EFFECTS>> (2005). Fire Effects Information System; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
- Huntsinger, L., M.P. McClaran, A. Dennis, and J. Bartolome. 1996. Defoliation response and growth of *Nassella pulchra* (A. Hitchc.) Barkworth from serpentine and non-serpentine grasslands. *Madroño* 43:46–57.
- Jackson, R.D. and J.W. Bartolome. 2007. Grazing ecology of California grasslands. Pp. 197-206 in: M.R. Stromberg, J.D. Corbin, and C.M. D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptiles species of special concern in California. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California.
- Johnson, C.J., and M.P. Gillingham. 2004. Mapping uncertainty: sensitivity of wildlife habitat ratings to expert opinion. *Journal of Applied Ecology* 41(6):1032–1041.
- Jones & Stokes. 2000. *Riparian Restoration Action Plan—Public Draft*. February. San José, CA. Prepared for the City of San José.



- Jones & Stokes. 2002. *Draft Biological Assessment for the Lower Guadalupe River Flood Protection Project*. February. (J&S 99-230.) Sacramento, CA. Prepared for Santa Clara Valley Water District.
- Jones & Stokes. 2005. Alameda Watershed Habitat Conservation Plan, Biological Resources Report. Prepared for the San Francisco Public Utilities Commission. Administrative Draft. Available: <www.sfwater.org>.
- Katibah, E.F. 1984. A brief history of riparian forests in the Central Valley of California. Pages 23–29 in R. E. Warner and K. M. Hendrix (eds.), *California Riparian Systems: Ecology, Conservation, and Productive Management*. Berkeley, CA: University of California Press.
- Keddy, P.A. 2000. *Wetland Ecology*. Cambridge, UK: Cambridge University Press.
- Keeler-Wolf, T., K. Lewis, and C. Royce. 1997. The definition and location of central California sycamore alluvial woodland, unpublished report. Sacramento, CA: State of California, The Resources Agency, Department of Fish and Game.
- Keeley, J.E. 1993. Assessing Suitable Sites for Grassland Restoration. Pages 277–281 in J. E. Keeley (ed.), *Interface Between Ecology and Land Development in California*. Los Angeles, CA: Southern California Academy of Sciences.
- Keeley, J.E. 2000. Chaparral. Pages 203–253 in M. G. Barbour and W. D. Billings (eds.), *North American Terrestrial Vegetation* (2<sup>nd</sup> ed.). Cambridge, England: Cambridge University Press.
- Keeley, J.E. 2002. Native American impacts on fire regimes of the California Coastal Ranges. *Journal of Biogeography* 29:303–320.
- Keeley, J.E. 2004. Invasive Plants and Fire Management in California Mediterranean-Climate Ecosystems. *Proceedings of the 10<sup>th</sup> MEDECOS Conference, April 25–May 1, 2004*. Pages 1–10.
- Kennedy, D.G., and C.S. Hitchcock. 2004. Overview paper: seismic hazard of the range front thrust faults, northeastern Santa Cruz Mountains/southwestern Santa Clara Valley. Pages 1–3 in D. G. Kennedy and C. S. Hitchcock (eds.), *Seismic Hazard of the Range Front Thrust Faults, Northeastern Santa Cruz Mountains/Southwestern Santa Clara Valley*. (Field Trip Guidebook, AEG San Francisco Section, March 27, 2004.) San Francisco, CA: Association of Engineering and Environmental Geologists.
- Kruckeberg, A.R. 1954. The ecology of serpentine soils: a symposium. III. Plant species in relation to serpentine soils. *Ecology* 35:267–274.
- Kruckeberg, A.R. 1984. *California Serpentine: Flora, Vegetation, Geology, Soils, and Management Problems*. Berkeley, CA: University of California Press.

- Kyser G.B. and J.M. DiTomaso. 2002. Instability in a grassland community after the control of yellow starthistle (*Centaurea solstitialis*) with prescribed burning. *Weed Science* 50(5):648–657.
- Lincoln, R., G. Boxshall, P. Clark. 1998. *A Dictionary of Ecology, Evolution and Systematics*. Second Edition. Cambridge University Press, Cambridge, UK.
- Locke, J. P. 2002. *Vineyards in the Watershed*. Napa, CA: Napa Sustainable Winegrowing Group.
- Marañón, T. and J.W. Bartolome. 1994. Coast live oak (*Quercus agrifolia*) effects on grassland biomass and diversity. *Madroño* 41(1):39–52.
- Mayer, K.E., and W.F. Laudenslayer, Jr. (eds.). 1988. *A Guide to Wildlife Habitats of California*. Sacramento, CA: California Department of Forestry and Fire Protection.
- Mayer, K.E., and W.F. Laudenslayer, Jr. (eds.). 1999. *Supplement to A Guide to Wildlife Habitats of California*. Sacramento, CA: California Department of Forestry and Fire Protection.
- McCarten, N.F. 1987. Ecology of the serpentine vegetation in the San Francisco Bay region. Pages 335–339 in T. Elia (ed.), *Conservation and Management of Rare and Endangered Plants—Proceedings from a Conference of the California Native Plant Society*. Sacramento, CA: The California Native Plant Society.
- McCreary, D.D. 2009. Regenerating rangeland oaks in California. Pub 2160e. University of California Agriculture and Natural Resources.
- McNaughton, S.J. 1968. Structure and function in California grasslands. *Ecology* 49:962–972.
- Menke, J.W. 1992. Grazing and fire management for native perennial grass restoration in California grasslands. *Fremontia* 20(2):22–25.
- Merelender, A., and J. Crawford. 1998. *Vineyards in an Oak Landscape*. University of California, Division of Agriculture and Natural Resources.
- Midpeninsula Regional Open Space District. 2006. *Your Preserves*. Last revised: June 3, 2006. Available: [http://www.openspace.org/preserves/pr\\_sierra\\_azul.asp](http://www.openspace.org/preserves/pr_sierra_azul.asp). Accessed: June 22, 2006.
- Miles, S.R., and C.B. Goudey. 1997. *Ecological Subregions of California*. USDA Forest Service, Pacific Southwest Region, R5-EM-JP-005.
- Mooney, H.A., J. Lubchenco, R. Dirzo, and O.E. Sala. 1995. Biodiversity and ecosystem functioning: basic principles. Pages 275–325 in V. H. Heywood (ed.), *Global Biodiversity Assessment*. Published for the United Nations Environment Programme. Cambridge, UK: Cambridge University Press.

- National Park Service. 2006. *Santa Clara County: California's Historic Silicon Valley: Early History*. Available: <http://www.cr.nps.gov/nr/travel/santaclara/history.htm>.
- National Research Council. 2001. *Compensating for Wetland Losses under the Clean Water Act*. Washington, DC: Committee on Mitigating Wetland Losses, Board on Environmental Studies and Toxicology.
- Norris, R.M., and R.W. Webb. 1990. *Geology of California*. 2<sup>nd</sup> edition. New York, NY: John Wiley & Sons.
- Noss, R. F., M. A. O'Connell, and D. D. Murphy. 1997. *The Science of Conservation Planning: Habitat Conservation Planning under the Endangered Species Act*. Covelo, CA: Island Press.
- Oakland Museum of California. No date. Available: <http://www.museumca.org/creeks/1400-RescGuadalupe.html>. Accessed: May 9, 2006.
- Parker, V.T., and C.H. Muller. 1982. Vegetational and environmental changes beneath isolated live oak trees (*Quercus agrifolia*) in a California annual grassland. *American Midland Naturalist* 107(1):69–81.
- Pavlik, B.M., P.C. Muick, S.G. Johnson, and M. Popper. 1991. *Oaks in California*. Los Olivos, CA: Cachuma Press.
- Payson, T.E., R.J. Ansley, J.K. Brown, G.J. Gottfried, S.M. Haase, M.G. Harrington, M.G. Narog, S.S. Sackett, and R.C. Wilson. 2000. Fire in western shrubland, woodland, and grassland ecosystems. Pages 121–159 in J. K. Brown and J. K. Smith (eds.), *Wildland Fire and Ecosystems: Effects of Fire on Flora*. (General Technical Report RMRS-GTR-412-Vol. 2.) Ogden, UT: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station.
- Pearce, J.L., and M.S. Boyce. 2006. Modelling distribution and abundance with presence-only data. *Journal of Applied Ecology* 43.
- Pine Ridge Association. 2006a. Bird list for Henry W. Coe State Park. Available: <http://www.coepark.org/natural-history.html>. Accessed May, 2006.
- Pine Ridge Association. 2006b. Reptile and amphibian list for Henry W. Coe State Park. Available: <http://www.coepark.org/natural-history.html>. Accessed May, 2006.
- Pine Ridge Association. 2006c. Vascular plant list for Henry W. Coe State Park. Available: <http://www.coepark.org/natural-history.html>. Accessed May, 2006.
- Poland, J.F. 1969. *Land Subsidence and Aquifer-System Compaction, Santa Clara Valley, California, USA*. September. Association Internationale d'Hydrologie Scientifique, Actes du Colloque de Tokyo.

- Poland, J.F. and R.L. Ireland. 1988. *Land Subsidence in the Santa Clara Valley, California as of 1982*. (U.S. Geological Survey Professional Paper 497-F.) Menlo Park, CA: U.S. Geological Survey.
- Prunuske 1987. Groundwork: A Handbook for Erosion Control in North Coastal California. 1987. Liza Prunuske for the Marin County Resource Conservation District.
- Rana Creek Habitat Restoration. 2004. *Coyote Lake-Harvey Bear Ranch County Park Natural Resource Management Plan*. January. Prepared for the Santa Clara County Parks & Recreation Department.
- Randall, J.M. and M.C. Hoshovosky. 2000. California's wildland invasive plants, pp. 11-19 in: C.C. Bossard, J.M. Randall, and M.C. Hoshovosky (Eds.) *Invasive plants of California's wildlands*. Berkeley: University of California Press.
- Reiner, R.J. 2007. Fire in California grasslands. Pp. 207-217 in: M.R. Stromberg, J.D. Corbin, and C.M. D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- Rizzo, D.M., and M. Garbelotto. 2003. Sudden oak death: endangering California and Oregon forest ecosystems. *Frontiers in Ecology and the Environment* 1(4):197–204.
- RMC. 2005. Soap Lake Floodplain Preservation Project. Final Initial Study and Negative Declaration. March. Prepared for the Pajaro River Flood Prevention Authority.
- Rundel, P.W. and R. Gustafson. 2005. *Introduction to the Plant Life of Southern California*. (California Natural History Guide Series No. 85.) Berkeley and Los Angeles, CA: University of California Press.
- Sacchi, C.F., and P.W. Price. 1992. Factors influencing seedling establishment in *Salix lasiolepis* (arroyo willow). *American Journal of Botany* 79:395–405.
- Safford, H.D., J.H. Viers, and S.P. Harrison. 2005. Serpentine endemism in the California flora: a database of serpentine affinity. *Madroño* 52:222–257.
- San Francisco Estuary Institute. 2006. *Coyote Creek Watershed Historical Ecology Study: Historical Conditions and Landscape Change in the Eastern Santa Clara Valley, California*. Final Report to the Santa Clara Valley Water District, San José, CA. January.
- San Francisco Estuary Institute. 2007. *Historical Ecology of South Santa Clara County: Preliminary Findings*. A Technical Memorandum to the Santa Clara Valley HCP/NCCP. April.

- San Francisco Estuary Institute. 2008. *South Santa Clara County Historical Ecology Study Including Soap Lake, The Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks*. Final Report to the Santa Clara Valley Water District, San José, CA. May.
- Santa Clara Basin Watershed Management Initiative. 2003. *Watershed Characteristics Report. Watershed Management Plan, Volume One (Unabridged; Revised Version)*. Prepared by the Santa Clara Basin Watershed Management Initiative. August. Available: <[http://www.valleywater.org/\\_WMI/Related\\_report/Wcr2003r.cfm](http://www.valleywater.org/_WMI/Related_report/Wcr2003r.cfm)>. Accessed: May 2006.
- Santa Clara Basin Watershed Management Initiative. 2003. *Watershed Action Plan: Executive Summary 2003*. Santa Clara Basin Watershed Management Initiative. Available: <<http://www.scbwmi.org>>.
- Santa Clara Valley Transportation Authority. 2006. *VTA-Coyote Ridge Resource Management Plan*. June. San José, CA. Prepared for United States Department of Interior Fish and Wildlife Service.
- Santa Clara Valley Water District. 2000. *Draft Stream Maintenance Program*. Available: <[http://www.valleywater.org/Water/Technical\\_Information/Technical\\_Reports/\\_Reports/\\_SMP/Stream\\_Maintenance\\_Program\\_Document.shtm](http://www.valleywater.org/Water/Technical_Information/Technical_Reports/_Reports/_SMP/Stream_Maintenance_Program_Document.shtm)>. Accessed October 2006.
- Santa Clara Valley Water District. 2001. *SCVWD Stream Maintenance Program. Program Environmental Impact Report*. Draft. March. Available: <[http://www.valleywater.org/Water/Technical\\_Information/Technical\\_Reports/\\_Reports/\\_SMP/deirtoc.shtm](http://www.valleywater.org/Water/Technical_Information/Technical_Reports/_Reports/_SMP/deirtoc.shtm)>. Accessed June 1, 2006.
- Santa Clara Valley Water District. 2002a. *Coyote Watershed Stream Stewardship Plan*. First Compilation February 2002. San José, CA: Santa Clara County Water District. Chapter 4. Available: <[http://www.valleywater.org/\\_wmi/Related\\_report/index.cfm](http://www.valleywater.org/_wmi/Related_report/index.cfm)>. Accessed: May, 2006.
- Santa Clara Valley Water District. 2002b. *Recharge*. Available: <[http://www.valleywater.org/Water/Where\\_Your\\_Water\\_Comes\\_From/Local\\_Water/Groundwater/Recharge.shtm](http://www.valleywater.org/Water/Where_Your_Water_Comes_From/Local_Water/Groundwater/Recharge.shtm)>. Accessed: May 4, 2006. Last Revised: 2002.
- Santa Clara Valley Water District. 2002c. *Uvas-Llagas Watershed*. Last revised: 2002. Available: <[http://www.valleywater.org/Water/Watersheds\\_\\_streams\\_and\\_floods/Watershed\\_info\\_&\\_projects/Uvas-Llagas/index.shtm](http://www.valleywater.org/Water/Watersheds__streams_and_floods/Watershed_info_&_projects/Uvas-Llagas/index.shtm)>. Accessed: April 27, 2006.
- Santa Clara Valley Water District. 2002d. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2. January 2002. San José, CA.

- Santa Clara Valley Water District. 2002e. *Fisheries and Aquatic Habitat Collaborative Effort*. Last revised: 2002. Available: <[http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Taking\\_care\\_of\\_streams/FAHCE/index.shtm](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Taking_care_of_streams/FAHCE/index.shtm)>. Accessed: January 19, 2006.
- Santa Clara Valley Water District. 2003. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2 and Section 10(a)(1)(A) Permit No. TE-005878-3. December 2003. San José, CA.
- Santa Clara Valley Water District. 2004. Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-3. December 2004. San José, CA.
- Santa Clara Valley Water District. 2005. *Reservoirs*. Last revised: 2005. Available at: <[http://www.valleywater.org/Water/Where\\_Your\\_Water\\_Comes\\_From/Local\\_Water/Reservoirs/index.shtm](http://www.valleywater.org/Water/Where_Your_Water_Comes_From/Local_Water/Reservoirs/index.shtm)>. Accessed: May 4, 2006.
- Santa Clara Valley Water District. 2006. *About Us: Santa Clara County Water District*. Available: <[http://www.valleywater.org/About\\_Us/index.shtm](http://www.valleywater.org/About_Us/index.shtm)>. Accessed: March 17, 2006.
- Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. Sacramento, CA: California Native Plant Society.
- Schiffman, P.M. 2007. Pleistocene and Pre-European Grassland Ecosystems: Species Composition at the time of first European settlement. Pp. 52-56 in: M.R. Stromberg, J.D. Corbin, and C.M. D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- Schoenherr, A.A. 1992. *A Natural History of California*. (California Natural History Guide 56.) Berkeley, CA: University of California Press.
- Shanfield, A.N. 1984. Alder, cottonwood and sycamore distribution and regeneration along the Nacimiento River. In R. E. Warner and K. M. Hendrix, *California Riparian Systems: Ecology, Conservation and Productive Management*. Berkeley: University of California Press.
- South Bay Birders Unlimited. 2007. Santa Clara County Bird Checklists. Updated February 15, 2007. Accessed June 2008. Available at: <<http://www.stanford.edu/~kendric/birds/SCbirds/SCbirds.html>>.
- Spencer, W. D., S. J. Barry, S. R. Beissinger, J. L. Florsheim, S. Harrison, K. A. Rose, J. J. Smith, R. R. White. 2006. Report of Independent Science Advisors for Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP). December. Available: <<http://www.dfg.ca.gov/nccp/index.html>>.

- Stein, B.A. 2002. *States of the Union: Ranking America's Biodiversity*. Arlington, VA: NatureServe. Available: <<http://www.natureserve.org/Reports/stateofunions.pdf>>.
- Stein, B.A., L.S. Kutner, and J.S. Adams. 2000. *Precious Heritage: The Status of Biodiversity in the United States*. New York, NY: Oxford University Press.
- Steinberg, P.D. 2002. *Nassella pulchra*. In U.S. Department of Agriculture Forest Service, *Fire Effects Information System*. Available: <<http://www.fs.fed.us/database/feis/plants/graminoid/naspul/all.html>>.
- Sweitzer, R.A., and D.H. Van Vuren. 2002. Rooting and foraging effects of wild pigs on tree regeneration and acorn survival in California's oak woodland ecosystem. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.
- Thomas, J.H. 1961. *Flora of the Santa Cruz Mountains of California: A Manual of Vascular Plants*. Stanford University Press: Stanford, CA.
- Tyler, C.M., B.E. Mahall, F.W. Davis, and M. Hall. 2002. Factors limiting recruitment in valley and coast live oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.
- Tyler, C.M., D.C. Odion, and R.M. Callaway. 2007. Dynamics of woody species in the California grassland. Pp. 169-179, in: M.R. Stromberg, J.D. Corbin, and C.M.D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- U.S. Department of Agriculture. 1982. *Llagas Creek Watershed Final Environmental Statement/Report*. May. Davis, CA: U.S. Department of Agriculture, Soil Conservation Service.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2005. Soil Survey Geographic (SSURGO) database for Eastern Santa Clara Area, California (ca646). Fort Worth, Texas. Available: <<http://soildatamart.nrcs.usda.gov/>>.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Digital General Soil Map of U.S. Fort Worth, Texas. Available: <<http://soildatamart.nrcs.usda.gov/>>.

- U.S. Fish and Wildlife Service. 2001. "Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*): Final Rule." 50 CFR Part 17. Department of the Interior. April 30, 2001.
- U.S. Fish and Wildlife Service. 2002. *Draft Recovery Plan for Chaparral And Scrub Community Species East of San Francisco Bay, California*. Portland, OR: U.S. Fish and Wildlife Service Region 1. xvi + 306 pp.
- U.S. Forest Service. 1997. *Ecological subregions of California: section and subsection descriptions*, USDA, Forest Service, Pacific Southwest Region, San Francisco, CA. Available:  
<[http://www.fs.fed.us/r5/projects/ecoregions/title\\_page.htm](http://www.fs.fed.us/r5/projects/ecoregions/title_page.htm)>.
- U.S. Soil Conservation Service. 1968. *Soils of Santa Clara County*. Berkeley, CA: U.S. Department of Agriculture, Soil Conservation Service.
- Vogl, R.J. 1973. Ecology of knobcone pine in the Santa Ana Mountains, California. *Ecological Monographs* 43:125–143.
- Wagner, D.L., E.J. Bortugno, and R.D. McJunkin. 1991. *Geologic Map of the San Francisco–San José quadrangle*, Scale 1:250,000. (Regional Geologic Map Series, Map No. 5A.) Sacramento, CA: California Division of Mines and Geology.
- Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13:1476–1486.
- Weiss, S.B., and D.H. Wright. 2005. *Serpentine Vegetation Management Project 2005 Report*. (FWS Grant Agreement No 814205G240.) Menlo Park, CA.
- Weiss, S.B., and D.H. Wright. 2006. *Serpentine Vegetation Management Project 2006 Interim Report*. (FWS Grant Agreement No 814205G240.) Menlo Park, CA.
- Weiss, S.B., D.H. Wright, and C. Nieder. 2007. *Serpentine Vegetation Management Project Final Report*. Creekside Center for Earth Observation Report.
- Wentworth, C.M., J.C. Tinsley, D.W. Andersen, S.E. Graham, R.C. Jachens, E.A. Mankinen, and R.A. Williams. 2005. *Quaternary Deposits of the Santa Clara Valley, California*. (Paper 17-3, Cordilleran Section 101<sup>st</sup> Annual Meeting, April 29–May 1.) Available:  
<[http://gsa.confex.com/gsa/2005CD/finalprogram/abstract\\_85185.htm](http://gsa.confex.com/gsa/2005CD/finalprogram/abstract_85185.htm)>. Accessed: June 2006.
- Western Regional Climate Center. 2006. *San José, California (047821): Period of Record Monthly Climate Summary*. Available:  
<<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?casjos+sfo>>. Accessed: June 15, 2006.



Wild, C. 2002. San Francisco Bay Area Gap Analysis: A Preliminary Assessment of Priorities for Protecting Natural Communities. Oakland, CA. Prepared for the California State Coastal Conservancy.

WRA Environmental Consultants. 2008. Delineation of Areas Meeting Wetland and Other Waters Criteria: Day Ranch and Lucky Hereford Ranch, Santa Clara County, California. Prepared for Lucky Day Ranch California Partnership, Santa Clara, CA. March.

WRA Environmental Consultants. 2009. Bay Checkerspot Butterfly Habitat Analysis and Surveys 2008-2009, Young Ranch, Santa Clara County, California. Prepared for YCS Investments, San Francisco, CA. July.

### 13.3.2 Personal Communications

Abel, Jae. 2010. Biologist, Santa Clara Valley Water District. San José, CA. August 2010—Written comments on revised administrative draft of Chapter 3 submitted to ICF International.

Bryant, Kevin. President, Santa Clara Valley Chapter, California Native Plant Society. Personal rare plant occurrence sighting data, 2006–2007. Provided to David Zippin.

Fleury, Scott. Senior Conservation Biologist, Technology Associates, San Diego, CA. May 2006—Meeting with David Zippin, Jones & Stokes.

Gelfand, Alan. J. B. Duke Professor of Statistics and Decision Sciences, Duke University, Durham, NC. November 1, 2006—Phone conversation with Steve Citron-Pousty.

Grossinger, Robin. Director. Historical Ecology Program, San Francisco Estuary Institute, Oakland, CA. June 2006—Meeting with David Zippin, Jones & Stokes.

Hillman, Janell. Botanist, Santa Clara Valley Water District. Rare plant occurrence data. 2005—Provided to David Zippin.

Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.

Palcovik, Amy. Resource ecologist. California Department of Parks and Recreation, Monterey District. May 25, 2006—conversation with David Zippin.

Smith, Jerry. 2007. Professor of Biology. San José State University, San José, CA. July 2007—Written comments on administrative draft of Chapter 3 submitted to ICF International.

Smith, Jerry. 2009. Professor of Biology. San José State University, San José, CA. July. July 1, 2009—Written comments on revised administrative draft of Chapter 3 submitted to ICF International.

Weiss, Stuart. Biologist. Creekside Center for Earth Observation. July 2008—phone conversation with Katherine Bode, ICF Jones & Stokes.

WRA Environmental Consultants. 2012. Callenbach, Joanna. 2012. YCS Investments. February 2012—Email communication with Kathryn Gaffney, ICF International, to provide GIS data to update Plan serpentine maps. GIS data developed by WRA Environmental Consultants 2012.

## 13.4 Chapter 4

### 13.4.1 Printed References

Bay Area Air Quality Management District. 2010. *Final Bay Area 2010 Clean Air Plan*. Adopted September 15, 2010. Available: <<http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/Plans/2010%20Clean%20Air%20Plan/CAP%20Volume%20I%20%20Appendices.ashx>>. Accessed: June 22, 2012.

Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Lithicum, and T.A. Roberts (Eds.). 2007. Proceeding of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc., Point Reyes Station, CA vii+197 pp.

Bishop, G.A., Peddle, A.M., Stedman, D.H., 2010. On-road emission measurements of reactive nitrogen compounds from three California cities. *Environmental Science & Technology* 44, 3616e3620.

California Natural Diversity Database. 2009. Occurrence Reports for Santa Clara County for *Balsamorhiza macrolepis* var. *macrolepis*, *Campanula exigua*, *Castilleja affinis* ssp. *neglecta*, *Ceanothus ferrisiae*, *Cirsium fontinale* var. *campylon*, *Collinsia multicolor*, *Dudleya setchellii*, *Fritillaria liliacea*, *Hoita strobilina*, *Lessingia micradenia* var. *glabrata*, *Malacothamnus hallii*, *Monardella villosa* ssp. *i*, *Sanicula saxatilis*, *Streptanthus albidus* ssp. *albidus*, *Streptanthus albidus* ssp. *peramonus*. RareFind, Version 3.1.0 (Updated May 2, 2009). Sacramento, CA: California Department of Fish and Game.

California Natural Diversity Database. 2012. Occurrence information. RareFind, Version 3.1.0 (Updated April 2012). Sacramento, CA: California Department of Fish and Game.

Cappiella, K. and K. Brown. 2001. *Impervious Cover and Land Use in the Chesapeake Bay Watershed*. Center for Watershed Protection. Ellicott City, MD.

- Center for Watershed Protection. 2003. *Impacts of Impervious Cover on Aquatic Systems*. Ellicott City, MD.
- CH2M Hill. 2004. Annual Monitoring Report For The Metcalf Energy Center Ecological Preserve, Santa Clara County, California: Year 2-Initial Baseline Monitoring. March. Prepared for the Land Trust for Santa Clara County.
- Chester, Arnold Jr.; C.J. Gibbons. 1996. Impervious Surface Coverage; The Emergence of a Key Environmental Indicator. *Journal of the American Planning Association*. Spring 1996. Vol. 62, Issue 2.
- City of Gilroy. 2002. *Gilroy General Plan*. Gilroy, CA.
- City of San José. 2005. *San José 2020 General Plan*. San José, CA.
- Crump, D.E. 2001. Western Pond Turtle (*Clemmys marmorata pallid*) Nesting Behavior and Habitat Use. Master's Thesis. San José State University, San José, CA. 72 p.
- Davis, C.J. 1998. Western Pond Turtle (*Clemmys marmorata pallid*) Winter Habitat Use and Behavior. Master's thesis, San José State University, San José, CA. 74 p.
- DeSante, D. F., E. D. Ruhlen, and R. Scalf. 2007. The distribution and relative abundance of Burrowing Owls in California during 1991–1993: Evidence for a declining population and thoughts on its conservation. In *Proceedings of the California Burrowing Owl Symposium*, November 2003 (J. H. Barclay, K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts, eds.), pp. 1–41. Bird Populations Monogr. 1. The Institute for Bird Populations and Albion Environmental, Inc.
- Fenn, M.E., E.B. Allen, S.B. Weiss, S. Jovan, L.H. Geiser, G.S. Tonnesen, R.F. Johnson, L.E. Rao, B.S. Gimeno, F. Yuan, T. Meixner, and A. Bytnerowicz. 2010. Nitrogen critical loads and management alternatives for N-impacted ecosystems in California. *Journal of Environmental Management* 91:2404–2423.
- Glennon, M., and H. Kretser. 2005. *Impacts to Wildlife from Low Density, Exurban Development: Information and Considerations for Adirondack Park*. Adirondack communities and conservation program. (Technical Paper No. 3.) October.
- Haug, E. A., L. W. Oliphant. 1990. Movements, activity patterns, and habitat use of Burrowing Owls in Saskatchewan. *Journal of Wildlife Management* 54:27–35.

- Jennings, M. R. and M. P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. (Final Report.) (Contract 8023.) Prepared for California Department of Fish and Game, Rancho Cordova, CA.
- Kupferberg, S. J. 1994. Exotic Larval Bullfrogs (*Rana catesbeiana*) as Prey for Native Garter Snakes: Functional and Conservation Implications. *Herpetological Review* 25(3):95–97.
- Kupferberg, S. J. 1996. Hydrologic and geomorphic factors affecting conservation of a river-breeding frog (*Rana boylei*). *Ecological Applications* 6:1332–1344.
- Lenth, B. A., R. L. Knight, and W. C. Gilgert. 2006. Conservation value of clustered housing developments. *Conservation Biology* 20(5):1445–1456.
- Lohse, Kathleen A., David Newburn, Jeff Opperman, and Adina M. Merenlender. 2008. Forecasting Relative Impacts of Land Use on Anadromous Fish Habitat to Guide Conservation Planning. *Ecological Applications* 18(2): 467–482.
- National Marine Fisheries Service, California Department of Fish and Game, Streams for Tomorrow, San Jose State University, and Santa Clara Valley Water District Supply Management. 2009. *In-Stream Operations and Maintenance subheading Proposed Operating Rules for Water Supply Facilities in the Uvas and Llagas Watersheds*. January 20, 2009. Available: <[http://cf.valleywater.org/About\\_Us/Board\\_of\\_directors/Board\\_meetings/\\_2009\\_Published\\_Meetings/MG36935/AS36937/AS36941/AI37074/DO37177/DO\\_37177.pdf](http://cf.valleywater.org/About_Us/Board_of_directors/Board_meetings/_2009_Published_Meetings/MG36935/AS36937/AS36941/AI37074/DO37177/DO_37177.pdf)>. Accessed June 26, 2012.
- Pyke, C.R. and J. Marty. 2005. Cattle Grazing Mediates Climate Change Impacts on Ephemeral Wetlands. *Conservation Biology* 19(5): 1619–1625.
- Rosenberg, D. K., and Haley, K. L. 2004. The ecology of Burrowing Owls in the Agroecosystem of the Imperial Valley, California. *Studies in Avian Biology* 27:120–135.
- Santa Clara Valley Transportation Authority. 2006. *VT A-Coyote Ridge Resource Management Plan*. June. Prepared for the USFWS in consultation with H. T. Harvey & Associates and Stuart Weiss.
- Santa Clara Valley Water District. 1999a. *Final Environmental Impact Report/ Environmental Impact Statement for the Upper Guadalupe River Flood Control Project*. San José, CA: Santa Clara Valley Water District. Available at: <[http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Watershed\\_info\\_&\\_projects/Guadalupe/Upper\\_Guadalupe/Reports\\_&\\_documents/\\_Final\\_EIR/StartUp.html](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Watershed_info_&_projects/Guadalupe/Upper_Guadalupe/Reports_&_documents/_Final_EIR/StartUp.html)>

- Santa Clara Valley Water District. 1999b. *Santa Clara Valley Water District Guadalupe River Watershed Planning Study Engineer's Report Project No. 3015*. San José, CA: Flood Management and Policy Planning Unit. Available: <[http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Watershed\\_info\\_&\\_projects/Guadalupe/Upper\\_Guadalupe/Reports\\_&\\_documents/\\_Final\\_EIR/StartUp.html](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Watershed_info_&_projects/Guadalupe/Upper_Guadalupe/Reports_&_documents/_Final_EIR/StartUp.html)>.
- Santa Clara Valley Water District. 2001. Final General Re-Evaluation and Environmental Report for Proposed Project Modifications to the Guadalupe River Project Downtown San José, California. San José, CA: Santa Clara Valley Water District. Available at: <[http://www.spk.usace.army.mil/projects/civil/guadalupe/docs/finalgre/Start\\_Page.html](http://www.spk.usace.army.mil/projects/civil/guadalupe/docs/finalgre/Start_Page.html)>.
- Santa Clara Valley Water District. 2002. *Final Environmental Impact Report for the Lower Guadalupe River Flood Protection Project*. Final. San José, CA. prepared by Jones & Stokes, Sacramento, CA.
- Santa Clara Valley Water District. 2006. *About Us: Santa Clara County Water District*. Available: <[http://www.valleywater.org/About\\_Us/index.shtm](http://www.valleywater.org/About_Us/index.shtm)>. Accessed: March 17, 2006.
- Theobald, D. M. 2003. Targeting conservation action through assessment of protection and exurban threats. *Conservation Biology* 17(6):1624–1637.
- Townsend, S.E. and C. Lenihan. 2007. Burrowing owl status in the greater San Francisco Bay Area. Proceedings of the California Burrowing Owl Symposium. Pp 60-69. The Institute for Bird Populations. Point Reyes Station, CA
- Trenham, P.C. 1998. Radio tracking information. Unpublished manuscript. 6 pp.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. *Habitat Conservation Planning Handbook, as Amended*. November. Amended June 2000. Washington, DC.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. U.S. Fish and Wildlife Service, Portland, Oregon. 330+ pp.
- U.S. Fish and Wildlife Service. 2005. *Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the California Tiger Salamander, Central Population, Final Rule*. Federal Register 70(162):49380–49458. August 23.
- U.S. Fish and Wildlife Service. 2008. *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Bay Checkerspot Butterfly (Euphydryas editha bayensis)*. Final Rule. August 26. (50 Federal Register 17: 50406 –50452.)

- U.S. Fish and Wildlife Service. 2010. *Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-Legged Frog*. Final Rule. March 17. (75 Federal Register 51: 12816–12959.)
- U.S. Fish and Wildlife Service. 2011. *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation*. Sacramento, CA.
- Weiss, S. B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13(6):1476–1486.
- Weiss, S. B. 2006. *Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity*. (CEC-500-2005-165.) California Energy Commission, PIER Energy-Related Environmental Research.
- Weiss, S.B., D.H. Wright, and C. Niederer. 2007. Serpentine Vegetation Management Project Final Report. *Creekside Center for Earth Observation Report*.

## 13.4.2 Personal Communications

- Abel, Jae. Fishery biologist. Santa Clara Valley Water District, San José, CA. February 9, 2007—meeting with Jones & Stokes.
- Abrams, Kristi. City of Gilroy, Gilroy, CA. February 18, 2010—e-mail to Kathryn Gaffney, ICF International, forwarded by Ken Schreiber, County of Santa Clara.
- Arnold, Don. a. Santa Clara Valley Water District, San José, CA. July 17, 2008—e-mail exchange with Kathryn Gaffney, ICF Jones & Stokes.
- Arnold, Don. b. Santa Clara Valley Water District, San José, CA. October 10, 2007—e-mail exchange with Kathryn Gaffney, Jones & Stokes.
- Arnold, Don. c. Santa Clara Valley Water District, San José, CA. July 27, 2010—e-mail exchange with Kathryn Gaffney, ICF International.
- Arnold, Don. Santa Clara Valley Water District, San José, CA. February 6, 2008—phone conversation with Kathryn Gaffney, Jones & Stokes.
- Behzad, Julie. Public Works Senior Engineer. City of Morgan Hill, Morgan Hill, CA. May 9, 2008—e-mail to Kathryn Gaffney, ICF Jones & Stokes.
- Calnan, Ann. Senior Environmental Planner. Santa Clara Valley Transportation Authority, San José, CA. March 3, 2010—e-mail to Kathryn Gaffney, ICF International.

- Cameron, Dawn. a. Consulting Transportation Planner. County of Santa Clara Roads and Airports Department. San José, CA. October 20, 2006—e-mail with Kathryn Gaffney, Jones & Stokes.
- Cameron, Dawn. b. Consulting Transportation Planner. County of Santa Clara Roads and Airports Department. San José, CA. January 6, 2009—e-mail with Kathryn Gaffney, ICF Jones & Stokes.
- Danielsen, Akoni. City of San José. City of San José, San José, CA. November 22, 2009—e-mail to Kathryn Gaffney, ICF Jones & Stokes.
- Diamond, Tanya. M.S. candidate. Department of Biological Sciences, San José State University. Phone conversations with Troy Rahmig, Jones & Stokes. Winter/spring 2007.
- Eastwood, Rob. Senior Planner. County of Santa Clara. October 6, 2008—Comments on the Santa Clara Valley Habitat Plan Administrative Draft submitted to ICF International.
- Falkowski, John. a. County of Santa Clara, San José, CA. December 7, 2006—e-mail with Kathryn Gaffney, Jones & Stokes.
- Falkowski, John. b. County of Santa Clara, San José, CA. February 9, 2007—e-mail with Kathryn Gaffney, Jones & Stokes.
- Faus, William. Planning Division Manager, Gilroy. 2007—e-mail with Kathryn Gaffney, Jones & Stokes verifying potential future growth of Gilroy assumptions for cumulative impacts.
- Golden, Steve. Associate Planner. City of Morgan Hill, Morgan Hill, CA. December 21, 2006—e-mail to Kathryn Gaffney, Jones & Stokes.
- Hart, Jared. a. City of San José, Planner II. City of San José, San José, CA. November 15, 2006—e-mail to Kathryn Gaffney, Jones & Stokes.
- Hart, Jared. b. City of San José, Planner II. City of San José, San José, CA. May 3, 2007—e-mail to Kathryn Gaffney, Jones & Stokes.
- Hillman, Janell. 2010. Botanist. Santa Clara Valley Water District. September 15, 2010—Phone conversation with, and e-mail to, Rebecca Sloan, ICF.
- Hillman, Janell. Botanist. Santa Clara Valley Water District. May 2009—phone conversation with and e-mail to Kate Bode, Jones & Stokes.
- Honaker, Carl. Director. Santa Clara County Airports. July 18, 2008—e-mail exchange with Kathryn Gaffney, ICF Jones & Stokes.
- Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.

Peterson, Taylor. Program Director. TRA Environmental Sciences, Inc. April 30, 2007—e-mail exchange with David Zippin, Jones & Stokes.

Smelser, Rick. City of Gilroy, Gilroy, CA. March 23, 2010—e-mail to Kathryn Gaffney, ICF International.

Weiss, Stuart. Biologist. Creekside Center for Earth Observation. July 2008 phone conversation with Katherine Bode, ICF Jones & Stokes.

## 13.5 Chapter 5

### 13.5.1 Printed References

Albion Environmental, Inc. 2000. City of San Jose, burrowing owl habitat conservation strategy and implementation plan. Draft Final Report. April 2000.

Arcadis. 2008. Survey and Baseline Monitoring of Special Status Plants on Serpentine Habitat, United Technologies Corporation—Pratt and Whitney Rocketdyne Facility. October.

Bartolome, J. W., M. P. McClaren, B. H. Allen-Diaz, J. Dunne, L. D. Ford, R. B. Standiford, N. K. McDougald, and L. C. Forero. 2002. Effects of fire and browsing on regeneration of blue oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.

Bartolome, J.W. 2011. “Grazing Management for Native Grasses-A Research Review” Presentation to the Central Coast Rangeland Coalition, Vaquero Farms, October 20, 2011.

Bartolome, J.W. and R.R. Evett. 2010. Spatial and Temporal Dynamics of Biogenic Silica in Californian Grassland Soils. Final report to the Kearney Foundation of Soil Science, University of California, Davis.

Beier, P., and R. F. Noss. 2000. Documenting the conservation value of corridors. In *Missing Linkages: Restoring Connectivity to the California Landscape*. Conference proceedings and report prepared by the California Wilderness Coalition, The Nature Conservancy, the Biological Resources Division of the U.S. Geological Survey, the Center for Reproduction of Endangered Species, and California State Parks. Available: <<http://www.calwild.org/resources/publications>>.

Bell, H. M., J. A. Alvarez, L. L. Eberhardt, and K. Ralls. 1994. Distribution and abundance of San Joaquin kit fox; unpublished report. Sacramento, CA: California Department of Fish and Game, Nongame Bird and Mammal Section.



- Belli, J. 2007. The California red-legged frog in the ponds of Henry W. Coe State Park, A Herpetological Survey of the Ponds of Henry W. Coe State Park. Final Report 2001–2007. Pacheco Pass Wildlife Research Station. Hollister, CA.
- Belli, J. 2007. The California red-legged frog in the ponds of Henry W. Coe State Park, A Herpetological Survey of the Ponds of Henry W. Coe State Park. Final Report 2001–2007. Pacheco Pass Wildlife Research Station. Hollister, CA.
- Biotic Resources Group. 2001. *Alum Rock Park Riparian Management Plan*. Prepared for the City of San José, Department of Public Works, Parks and Recreation Facilities Division. April 30. 116 pp.
- Bobzien, S., and J.E. DiDonato. 2007. The status of the California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), Foothill Yellow-Legged Frog (*Rana boylei*), and other aquatic herpetofauna in the East Bay Regional Park District, California. East Bay Regional Park District 2007.
- Borchert, M. I., F. W. Davis, J. Michaelson, and L. D. Oyler. 1989. Interactions of factors affecting seedling recruitment of blue oak (*Quercus douglasii*) in California. *Ecology* 70:389–404.
- Bossard, C.C., J.M. Randall, and M.C. Hoshovsky (Eds.). 2000. Invasive plants of California's wildlands. Berkeley: University of California Press.
- Bourque, R.M. 2008. Spatial Ecology of an Inland Population of the Foothill Yellow-legged Frog (*Rana boylei*) in Tehama County, California. Master's Thesis. Humboldt State University.
- Brady and Associates. 1997. *Los Vaqueros Resource Management Plan*. Prepared for the Contra Costa Water District, Concord, CA.
- Brown, K.J., and R.J. Hebda. 1998. Long-term fire incidence in coastal forests of British Columbia. *Northwest Science* 72(special issue 2):64–66.
- California Climate Change Center. 2006. *Climate Change Impact on Forest Resources*. March. (CEC-500-2005-193-SF.) Available: <<http://www.energy.ca.gov/2005publications/CEC-500-2005-193/CEC-500-2005-193-SF.PDF>>.
- California Department of Fish and Game. 2003. *The Vegetation Classification and Mapping Program*. List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database. September edition. Sacramento, CA: Biogeographic Data Branch.
- California Department of Fish and Game. 2006. Unpublished data on existing culverts and other crossing points along U.S. 101 between south San Jose and Gilroy.

- California Department of Forestry and Fire Protection. 2005. *Fire Management Plan, Santa Clara Unit*. Available: [http://cdfdata.fire.ca.gov/fire\\_er/fpp\\_planning\\_plans\\_details](http://cdfdata.fire.ca.gov/fire_er/fpp_planning_plans_details).
- California Energy Commission. 2006. Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity. Prepared by University of California, Santa Barbara, and Creekside Center for Earth Observation. Public Interest Energy Research Program Publication CEC-500-2005-165. Available at <http://www.energy.ca.gov/2005publications/CEC-500-2005-165/CEC-500-2005-165.PDF>.
- California Invasive Plant Council. 2007. Cal-IPC Invasive Plant Inventory (on-line database). Available: <http://portal.cal-ipc.org/weedlist>.
- California Native Plant Society. 2001. Guidelines for Landscaping to Protect Native Vegetation from Genetic Degradation. Sacramento, CA.
- California Natural Diversity Database. 2009. Occurrence Reports for Santa Clara County for *Balsamorhiza macrolepis* var. *macrolepis*, *Campanula exigua*, *Castilleja affinis* ssp. *neglecta*, *Ceanothus ferrisiae*, *Cirsium fontinale* var. *campylon*, *Collinsia multicolor*, *Dudleya setchellii*, *Fritillaria liliacea*, *Hoita strobilina*, *Lessingia micradenia* var. *glabrata*, *Malacothamnus hallii*, *Monardella villosa* ssp. *i*, *Sanicula saxatilis*, *Streptanthus albidus* ssp. *albidus*, *Streptanthus albidus* ssp. *peramonus*. RareFind, Version 3.1.0 (Updated May 2, 2009). Sacramento, CA: California Department of Fish and Game.
- California Partners in Flight. 2002. The Oak Woodland Bird Conservation Plan: A Strategy for Protecting and Managing Oak Woodland Habitats and Associated Birds in California (S. Zack, lead author). Version 2.0. Point Reyes Bird Observatory, Stinson Beach, CA. Available: <http://www.prbo.org/calpif/plans.html>.
- California State Parks. 2007. Henry W. Coe State Park Wildfire Local Operating Agreement. March. Monterey District California State Parks, Monterey, California.
- California Wilderness Coalition. 2002. *Missing Linkages: Restoring Connectivity to the California Landscape*. Conference proceedings and report prepared by the California Wilderness Coalition, The Nature Conservancy, the Biological Resources Division of the U.S. Geological Survey, the Center for Reproduction of Endangered Species, and California State Parks. Available: <http://www.calwild.org/resources/publications>.
- Circuit Rider Productions. 2004. Riparian habitat restoration. Part XI of *California Salmonid Stream Habitat Restoration Manual*. Windsor, CA. Prepared for the California Department of Fish and Game, Sacramento, CA.
- City of Gilroy. 2005. *Draft Hecker Pass Specific Plan*. Gilroy, CA.

- City of Gilroy. 2006. GIS data. Provided to Jones & Stokes by the City of Morgan Hill, CA.
- City of Morgan Hill. 2006. GIS data. Provided to Jones & Stokes by the City of Morgan Hill, CA.
- City of San José. 2006. GIS data. Provided to Jones & Stokes by the City of San José, CA.
- City of San José. 2007. *Draft Environmental Impact Report for the Coyote Valley Specific Plan*. March. Prepared by David J. Powers and Associates, San José, CA. Available: <[http://www.sanjoseca.gov/coyotevalley/publications\\_DEIR.htm](http://www.sanjoseca.gov/coyotevalley/publications_DEIR.htm)>.
- Clewell, A., J. Rieger, and J. Munro. 2005. *Society for Ecological Restoration International: Guidelines for Developing and Managing Ecological Restoration Projects*. 2<sup>nd</sup> edition. December. Tucson, AZ: Society for Ecological Restoration International.
- Coastal Training Program, Elkhorn Slough National Estuarine Research Reserve. 2006. *Proceedings of the Sierra Azul Wildlife Connectivity Workshop*. October 11. Sponsored by the Coastal Training Program and the Silicon Valley Land Conservancy.
- Coletto, H. 2006. History of Wildlife Along the Coyote creek and 101 Corridor. Presentation at Sierra Azul Wildlife Connectivity Workshop. San José, CA. October 11.
- Contra Costa Water District. 2001. Los Vaqueros Project, Valley Oak, Blue Oak, and Riparian Woodland Habitat Mitigation Program, 2001 Annual Performance Report. (J&S 01-356.) September. Brentwood, CA. Prepared by Jones & Stokes, Sacramento, CA.
- Contra Costa Water District. 2002. *Los Vaqueros Project 2001 Annual California Red-Legged Frog and Predator Control Monitoring Report*. January. (J&S 01-356.) Brentwood, CA. Prepared with assistance from Jones & Stokes, Sacramento, CA.
- County of Santa Clara, Parks and Recreation Department. 2007. Coyote Creek Parkway County Park—Final Integrated Natural Resources Management Plan and Master Plan. Los Gatos, California.
- County of Santa Clara. 1987. Open Space Preservation: A Program for Santa Clara County. Report of the Preservation 2020 Task Force. San José, California. April.
- County of Santa Clara. 2006. Data on parcels and open space. Provided to Jones & Stokes by the Planning Department, San José, CA.

- Cousins, S.A.O., S. Lavorel, and I. Davies. 2003. Modelling the effects of landscape pattern and grazing regimes on the persistence of plant species with high conservation value in grasslands in south-eastern Sweden. *Landscape Ecology* 18(3):315–332.
- Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M.I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, K. Warner, and J. Graae. 1998. *The California Gap Analysis Project*. Final report. Moscow, ID: U.S. Geological Survey. See also: <[www.biogeog.ucsb.edu](http://www.biogeog.ucsb.edu)>.
- Davy, J.S., J.M. DiTomaso, and E.A. Laca. 2008. Barb goatgrass. University of California Division of Agriculture and Natural Resources, Publication #8315.
- DeSante, D.F., E.D. Ruhlen, S.L. Adamany, K.M. Burton and S. Amin. 1997. A census of burrowing owls in central California in 1991. Pages 38–48 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- DeSante, D.F. and E. Ruhlen. 1995. A census of burrowing owls in California, 1991-1993. Institute for Bird Populations, Point Reyes Station, California.
- DeSante, D.F., Burton, K.M., and Williams, O.E. 1993. The Monitoring Avian Productivity and Survivorship (MAPS) Program second annual report (1991). *Bird Populations* 1:68–97.
- Diamond, T. 2006. Identification of potential wildlife corridors utilized by the North American badger (*Taxidea taxus*) in the San Francisco Bay Area and Monterey County. Presentation at Sierra Azul Wildlife Connectivity Workshop. San José, CA. October 11. Available: <[http://www.elkhornsloughctp.org/training/show\\_train\\_detail.php?TRAIN\\_ID=SiHXR4](http://www.elkhornsloughctp.org/training/show_train_detail.php?TRAIN_ID=SiHXR4)>.
- DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and Other Western States. Vols. 1 and 2. University of California Agriculture and Natural Resources, Oakland, CA.
- DiTomaso, J.M., K. L. Heise, G. B. Kyser, A. M. Merenlender, and R. J. Keiffer. 2001. Carefully timed burning can control barb goatgrass. *California Agriculture* 55:47–53.
- Doubledee, R. A., E. B. Muller, and R. M. Nisbet. 2003. Bullfrogs, disturbance regimes, and the persistence of California red-legged frogs. *Journal Of Wildlife Management* 67:424–438.
- Easterling, D.R., G.A. Meehl; C. Parmesan; S.A. Changnon; T.R. Karl; L.O. Mearns. 2000. Climate extremes: observations, modeling, and impacts. *Science (New Series)* 289(5487):2068–2074

- EDAW. 2001. Biological Resources Assessment for the Santa Clara Valley Water District's Mid-Coyote Creek Project. Prepared for the Santa Clara Valley Water District. August. 59 pp.
- Ehrlich, P.R., and I. Hanski (eds.). 2004. *On the Wings of Checkerspots: A Model for Population Biology*. New York: Oxford University Press.
- FAHCE (Fisheries and Aquatic Habitat Collaborative Effort). 2000. Summary and Conclusion FAHCE TAC Evaluation of the Effects of Santa Clara Valley Water District Facilities and Operations on Factors Limiting Habitat Availability and Quality for Steelhead and Chinook Salmon, San José, California. San José, CA.
- Federal Interagency Stream Restoration Working Group. 1999. *Stream Corridor Restoration: Principles, Processes and Practices*. (GPO item #0120-A.) Available: <[http://www.nrcs.usda.gov/technical/stream\\_restoration/](http://www.nrcs.usda.gov/technical/stream_restoration/)>.
- Fitzpatrick, B.M. and H.B. Shaffer. 2004. Environment-dependent admixture dynamics in a tiger salamander hybrid zone. *Evolution*, 58(6):1282–1293.
- Fitzpatrick, B.M. and H.B. Shaffer. 2007. Introduction history and habitat variation explain the landscape genetics of hybrid tiger salamanders. *Ecological Applications* 17(2):598–608.
- Fleishman, E., D. D. Murphy, and P. F. Brussard. 2000. A new method for selection of umbrella species for conservation planning. *Ecological Applications* 10:569–579.
- Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins. *California Salmonid Stream Habitat Restoration Manual*. 1998. 3<sup>rd</sup> edition. Prepared by California Department of Fish and Game, Sacramento, CA.
- Ford, L.D., P. Van Hoorn, D.R. Rao, N.J. Scott, P.C. Trenham, and J.W. Bartolome. 2012 (in press). Managing Rangelands to Benefit the California Red-Legged Frog and California Tiger Salamander. Livermore, CA: Alameda County Resource Conservation District.
- Forister, M.L., and A.M. Shapiro. 2003. Climactic trends and advancing spring flight of butterflies in lowland California. *Global Change Biology* 9:1130–1135.
- Fried, J.S., M.S. Torn, E. Mills. 2004. The impact of climate change on wildfire severity: a regional forecast for northern California. *Climactic Change* 64:169–191.
- Fuhlendorf, S. D., and D. M. Engle. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. *Bioscience* 51:625–632.

- Germano, D. J., and R. B. Bury. 2001. Western pond turtles (*Clemmys marmorata*) in the Central Valley of California: Status and population structure. *Transactions of the Western Section of the Wildlife Society* 37:22-36.
- Gillespie, I. G., and E. A. Allen. 2004. Fire and competition in a southern California grassland: impacts on the rare forb *Erodium macrophyllum*. *Journal of Applied Ecology* 41:643-652.
- Groom, M. J., G. K. Meffe, and C. R. Carroll. 2006. *Principles of Conservation Biology*. Third edition. Sinauer Associates, Inc. Sunderland, MA.
- H.T. Harvey & Associates. 1999. *Santa Clara Valley Water District Foothill Yellow-Legged Frog Distribution and Status-1999*. Prepared for Santa Clara Valley Water District, San José, CA.
- H.T. Harvey & Associates. 2006. *Castro Valley Ranch Environmental Impact Report*. Biotic resources section. September 6. Prepared for David J. Powers & Associates San José, CA.
- Haight, R. G., B. Cypher, P. A. Kelly, S. Phillips, K. Ralls, and H. P. Possingham. 2004. Optimizing reserve expansion for disjunct populations of San Joaquin kit fox. *Biological Conservation* 117: 61-72.
- Hamilton, J. G., J. R. Griffin, and M. R. Stromberg. 2002. Long-term population dynamics of native *Nassella* (Poaceae) bunchgrasses in central California. *Madroño* 49:274-284.
- Hamilton, William J., III. 2004. *Tricolored Blackbird Management Recommendations and 2005 Survey Priorities*. Prepared for California Resource Management Institute, Sacramento, CA. Available: <<http://www.calresources.org/internal.asp?pid=5&spid=7>>.
- Hanski, I., P. R. Ehrlich, M. Nieminen, D. D. Murphy, J. J. Hellmann, C. L. Boggs, and J. F. McLaughlin. 2004. Checkerspots and conservation biology. Pages 264-287 in P.R. Ehrlich and Ilkka Hanski. (eds.), *On the Wings of Checkerspots: A Model for Population Biology*. New York: Oxford University Press.
- Harrison, S. 1999. Native and alien species diversity at the local and regional scales in a grazed California grassland. *Oecologia* 121:99-106.
- Harrison, S., B. D. Inouye, and H. D. Stafford. 2003. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. *Conservation Biology* 17:837-845.
- Harrison, S., D.D. Murphy, and P.R. Ehrlich. 1988. Distribution of the bay checkerspot butterfly, *Euphydryas editha bayensis*: evidence for a metapopulation model. *The American Naturalist* 132:360-382.

- Hayes, G., and K. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition in mesic grasslands in California. *Conservation Biology* 17:1694–1702.
- Hays, D. W., K. R. McAllister, S. A. Richardson, and D. W. Stinson. 1999. Washington State Recovery Plan for the Western Pond Turtle. Washington Department of Fish and Wildlife, Olympia, WA. August. Available: <<http://www.wdfw.wa.gov/wlm/diversty/soc/recovery/pondturt/wptfinal.pdf>>.
- Hillman, Janell. 2007. Constraints on population recruitment for a rare serpentine seep thistle. Master's thesis. San Francisco State University.
- Hilty, J. A., W. Z. Lidicker Jr., and A. M. Merenlender. 2006. *Corridor Ecology*. Washington, DC: Island Press.
- Hobbs, R. J., and D. A. Norton. 1996. Toward a conceptual framework for restoration ecology. *Restoration Ecology* 4:93–110.
- Holland R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. Sacramento, CA: State of California, The Resource Agency, Nongame Heritage Program, Department of Fish and Game.
- Horton, T. R., T. Bruns and V. T. Parker. 1999. Ectomycorrhizal fungi in *Arctostaphylos* patches contribute to the establishment of *Pseudotsuga menziesii*. *Canadian Journal of Botany* 77:93–102.
- Hunter, M. L. 2005. A mesofilter conservation strategy to complement fine and coarse filters. *Conservation Biology* 19:1025–1029.
- Huntsinger, L., J.W. Bartolome, and C.M. D'Antonio. 2007. Grazing management on California's Mediterranean grasslands. Pp. 233-253, in: M.R. Stromberg, J.D. Corbin, and C.M.D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- ICF International. 2010a. Alameda Watershed Habitat Conservation Plan. Prepared for the San Francisco Public Utilities Commission, San Francisco, CA. Administrative Draft.
- ICF International. 2010b. San Francisco Bay Area Operations and Maintenance Habitat Conservation Plan. Prepared for Pacific Gas & Electric Company, San Francisco, CA. Administrative Draft. January.
- Jones & Stokes Associates. 1988. *Oak Regeneration Assessment—A Problem Analysis*. (JSA 86-072.) Sacramento, CA. Prepared for the California Department of Forestry and Fire Protection, Forest and Rangeland Resources Assessment Program, Sacramento, CA.

- Jones & Stokes Associates. 1989. *Results of Biological Resource Inventories and Habitat Evaluations in the Kellogg Creek Watershed*. February. (JSA 87-031.) Sacramento, CA. Prepared for James M. Montgomery, Consulting Engineers, Inc., and the Contra Costa Water District.
- Jones & Stokes Associates. 1991. *A Conceptual Plan to Mitigate Impacts on Valley Oak Habitat for the Los Vaqueros Reservoir Project*. December. (JSA 90-211.) Sacramento, CA. Prepared for Contra Costa Water District, Concord, CA.
- Jones & Stokes Associates. 1992. *Draft Wetland Mitigation Pilot Study: Results of Wetland Investigations and Enhancements*. August. (JSA 90-309.) Sacramento, CA. Prepared for Contra Costa Water District, Concord, CA.
- Jones & Stokes. 2000. *Riparian Restoration Action Plan—Public Draft*. February. Prepared for the City of San José. San José, CA.
- Jones & Stokes. 2006. East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan. Prepared for the East Contra Costa County Habitat Conservation Planning Association, Martinez, CA. October.”
- Jones & Stokes. 2007. Field data collected on Highway 101 and SR 152 by Troy Rahmig, Wildlife Biologist.
- Keddy, P. 2000. *Wetland Ecology Principles and Conservation*. Cambridge, U.K.: Cambridge University Press. 614 pp.
- Keeler-Wolf, T., K. Lewis, and C. Roye. 1997. The definition and location of central California sycamore alluvial woodland; unpublished report. State of California, The Resources Agency, Department of Fish and Game, Sacramento, CA.
- Keeley, J. E. 2002. Fire management of California shrubland landscapes. *Environmental Management* 29:395–408.
- Keeley, J. E. 2005. Fire history of the San Francisco East Bay region and implications for landscape patterns. *International Journal of Wildland Fire* 14:285–296.
- Keeley, J. E., and C. J. Fotheringham. 2001. Historic fire regime in southern California shrublands. *Conservation Biology* 15:1536–1548.
- Keeley, J. E., C. J. Fotheringham, and M. Morais. 1999. Reexamining fire suppression impacts on brushland fire regimes. *Science* 284:1829–1832.
- Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. (Biological Technical Publication FWS/BTP-R6001-2003.) Washington, DC: U.S. Department of Interior, Fish and Wildlife Service.



- Kupferberg, S., Lind, A.J., and Palen, W. J. 2009. *Pulsed Flow Effects on the Foothill Yellow-Legged Frog (Rana boylii): Population Modeling*. Final Report. California Energy Commission, PIER Program. Publication number TBD.
- Lambeck, R. J. 1997. Focal species: a multi-species umbrella for nature conservation. *Conservation Biology* 11:849–856.
- Lawrence D. Ford Rangeland Management and Conservation Science and EcoSystems West Consulting Group. 2011. Grazing Management Plan, Santa Teresa County Park, San Jose, California. Prepared for Santa Clara County Department of Parks and Recreation.
- Le Fer, D., and V. T. Parker. 2005. The effect of seasonality of burn on seed germination in chaparral: the role of soil moisture. *Madroño* 52:166–174.
- Leidy, R. A., G. S. Becker & B. N. Harvey. 2005. *Historical Distribution and Current Status of Steelhead/Rainbow Trout (Oncorhynchus mykiss) in Streams of the San Francisco Estuary, California*. Oakland, CA: Center for Ecosystem Management and Restoration. 275 pp.
- Lenihan, J.M., R. Drapek, D. Bachelet, and R.P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. *Ecological Applications* 13(6):1667–1681.
- Lind, A.J. 2005. Reintroduction of a Declining Amphibian: Determining an Ecologically Feasible Approach for the Foothill Yellow-legged Frog (*Rana Boylii*) Through Analysis of Decline Factors, Genetic Structure, and Habitat Associations. PhD Dissertation, University of California-Davis.
- Margules, C. R., and R. L. Pressey. 2000. Systematic conservation planning. *Nature* 405:243-253. Available: <<http://www.geography.ryerson.ca/jmaurer/411SystConservPlan.pdf>>.
- Marty, J. T. 2005. Effects of Cattle Grazing on Diversity in Ephemeral Wetlands. *Conservation Biology* 19:1626–1632.
- Merenlender, A., and J. Crawford. 1998. Vineyards in an Oak Landscape: Exploring the Physical, Biological and Social Benefits of Maintaining and Restoring Native Vegetation in and around the Vineyard. Davis, CA: University of California Integrated Hardwood Range Management Program.
- Metcalf Energy Center. 2006. *Air Quality Monitoring Results*. June. Available: <[http://www.metcalfenergycenter.com/air/Calpine\\_June\\_2006\\_Data.pdf](http://www.metcalfenergycenter.com/air/Calpine_June_2006_Data.pdf)>.
- Middleton, B. 1999. Wetland Restoration, Flood Pulsing and Disturbance Dynamics. New York, NY: John Wiley & Sons. 388 pp.

- Millar, C.I., R. Neilson, D. Bachelet, R. Drapek, and J. Lenihan. 2006. Climate change at multiple scales. Pages 31–60 in Salwasser, H. and M. Cloughesy (eds), *Forests, Carbon and Climate Change: A Synthesis of Science Findings*. Portland, OR: Oregon Forest Resources Institute.
- Mitsch, W.J., J.G. Gosselink. 1993. *Wetlands*. New York, NY: Van Nostrand Reinhold. 722 pp.
- Murphy, D.D. 1988. The Kirby Canyon conservation agreement: a model for resolution of land-use conflicts involving threatened invertebrates. *Environmental Conservation* 15:45–48.
- Murphy, D.D., and S.B. Weiss. 1992. Effects of climate change on biological diversity in Western North America: species losses and mechanisms. Pages 355–368 in R. L. Peters and T. E. Lovejoy (eds.), *Global Warming and Biological Diversity*. Castleton, NY: Hamilton Printing.
- Murphy, D.D., K. E. Freas, and S. B. Weiss. 1990. An environment-metapopulation approach to population viability analysis for a threatened invertebrate. *Conservation Biology* 4:41–51.
- National Audubon Society. 2008. Important Bird Areas in the United States. Available: <[www.audubon.org/bird/iba](http://www.audubon.org/bird/iba)>. Accessed July, 2008.
- National Research Council. 2001. *Compensating for Wetland Losses under the Clean Water Act*. Washington, DC: Committee on Mitigating Wetland Losses, Board on Environmental Studies and Toxicology.
- Noss, R. F. 1987. From plant communities to landscapes in conservation inventories: a look at The Nature Conservancy (USA). *Biological Conservation* 41:11–37.
- Noss, R. F., LaRoe E. T., Scott J. M. 1995. *Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation*. (Biological Report 28.) Washington, DC: U.S. Geological Survey. Available: <<http://biology.usgs.gov/pubs/ecosys.htm>>.
- Noss, R. F., M. A. O'Connell, and D. D. Murphy. 1997. *The Science of Conservation Planning: Habitat Conservation Planning under the Endangered Species Act*. Covelo, CA: Island Press.
- Parmesan, C., N. Ryrholm, C. Stefanescu, J.K. Hill, C.D. Thomas, H. Descimon, B. Huntley, L. Kaila, J. Kullberg, T. Tammaru, W.J. Tennent, J.A. Thomas, and M. Warren. 1999. Poleward shifts in geographical ranges of butterfly species associated with regional warming. *Nature* 399:579–583.
- Pavlik, B. M., P. C. Muick, S. G. Johnson, and M. Popper. 1991. *Oaks in California*. Los Olivos, CA: Cachuma Press.
- Pimm, S.L. 2001. Entrepreneurial insects. *Nature* 411:531–532.

- Pounds, J.A., M.R. Bustamante, L.A. Coloma, J.A. Consuegra, M.P.L. Fogden, P.N. Foster, E. La Marca, K.L. Masters, A. Merino-Viteri, R. Puschendorf, S.R. Ron, G.A. Sánchez-Azofeifa, C.J. Still, and B.E. Young. 2006. Widespread amphibian extinctions from epidemic disease driven by global warming. *Nature* 439:161–167.
- Primack, R. B. 1993. *Essentials of Conservation Biology*. Sunderland, MA: Sinauer Associates.
- Rana Creek Habitat Restoration. 2004. *Coyote Lake-Harvey Bear Ranch County Park Natural Resource Management Plan*. January. Prepared for the Santa Clara County Parks & Recreation Department.
- Reese, D. A. 1996. Comparative demography and habitat use of western pond turtles in northern California: the effects of damming and related alterations. Ph.D. dissertation, University of California, Berkeley.
- Rice, P.M. 2005. *Fire as a Tool for Controlling Nonnative Invasive Plants*. Available: <[http://www.weedcenter.org/management/burning\\_weeds.pdf](http://www.weedcenter.org/management/burning_weeds.pdf)>. Accessed: March 12, 2007.
- Riparian Habitat Joint Venture. 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. Available: <<http://www.prbo.org/calpif/pdfs/riparian.v-2.pdf>>.
- Rogers, D.L., and R.D. Westfall. 2007. Spatial genetic patterns in four old-growth populations of coast redwood. (USDA Forest Service General Technical Report PSW-GTR-194.) Pages 59–63 in Standiford, R. B., G. A. Giusti, Y. Valachovic, W. J. Zielinski, and M. J. Furniss (eds.), *Proceedings of the Redwood Region Forest Science Symposium: What Does the Future Hold?*, March 15–17, 2004, Rohnert Park, CA. Albany, CA: U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station. Available: <[http://www.fs.fed.us/psw/publications/westfall/psw\\_2007\\_westfall009.pdf](http://www.fs.fed.us/psw/publications/westfall/psw_2007_westfall009.pdf)>.
- Root, T.L., D.P. MacMynowski; M.D. Mastrandrea; S.H. Schneider. 2005. Human-modified temperatures induce species changes: joint attribution. *Proceedings of the National Academy of Sciences of the United States of America* 102(21):7465–7469.
- Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig, and J.A. Pounds. 2003. Fingerprints of global warming on wild animals and plants. *Nature* 421:57–60.
- Rubinoﬀ, D. 2001. Evaluating the California gnatcatcher as an umbrella species for conservation of southern California coastal sage scrub. *Conservation Biology* 15:1374–1383.

- San Francisco Estuary Institute. 2006. *Coyote Creek Historical Ecology Study*. January. Oakland, CA. Prepared for the Santa Clara Valley Water District. 230 pages.
- San Francisco Estuary Institute. 2007. *Historical Ecology of South Santa Clara County: Preliminary Findings*. A technical memorandum to the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan. April.
- San Francisco Estuary Institute. 2008. South Santa Clara County Historical Ecology Study Including Soap Lake, The Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks. Final Report to the Santa Clara Valley Water District, San José, CA. May.
- Santa Clara Basin Watershed Management Initiative (SCBWMi). 2003. *Watershed Action Plan*. August. Available: <<http://www.scbwmi.org/wmi-wap.htm>>. Accessed: February 2007.
- Santa Clara Valley Transportation Authority. 2006. *VTa-Coyote Ridge Resource Management Plan*. June. San José, CA. Prepared for United States Department of Interior Fish and Wildlife Service.
- Santa Clara Valley Water District. 2002c. *Coyote Watershed Stream Stewardship Plan*. First compilation. February 2002. Available: <[http://www.valleywater.org/\\_wmi/Related\\_report/index](http://www.valleywater.org/_wmi/Related_report/index)>.
- Santa Clara Valley Water District. 2005. *Reservoirs*. Last revised: 2005. Available at: <[http://www.valleywater.org/Water/Where\\_Your\\_Water\\_Comes\\_From/Local\\_Water/Reservoirs/index.shtm](http://www.valleywater.org/Water/Where_Your_Water_Comes_From/Local_Water/Reservoirs/index.shtm)>. Accessed: May 4, 2006.
- Santa Clara Valley Water District. 2006. *User Manual: Guidelines & Standards for Land Use Near Streams: A Manual of Tools, Standards and Procedures to Protect Streams and Streamside Resources in Santa Clara County*. Santa Clara Valley Water Resources Protection Collaborative. July. Available: <[http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Taking\\_care\\_of\\_streams/\\_Guidelines\\_&\\_standards/Guidelines\\_&\\_Standards.shtm](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Taking_care_of_streams/_Guidelines_&_standards/Guidelines_&_Standards.shtm)>.
- Santa Clara Valley Water District. 2010. *Stream Maintenance Program*. Available: <<http://www.valleywater.org/Services/StreamMaintenanceProgram.aspx>>.
- Santa Clara Valley Water Resources Protection Collaborative. 2006. *User Manual: Guidelines & Standards for Land Use Near Streams: A Manual of Tools, Standards and Procedures to Protect Streams and Streamside Resources in Santa Clara County*. July. Available: <[http://www.valleywater.org/Water/Watersheds\\_-\\_streams\\_and\\_floods/Taking\\_care\\_of\\_streams/\\_Guidelines\\_&\\_standards/Guidelines\\_&\\_Standards.shtm](http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Taking_care_of_streams/_Guidelines_&_standards/Guidelines_&_Standards.shtm)>.

- Schoenberg, F., R. Peng, Z. Huang, and P. Rundel. 2003. Detection of nonlinearities in the dependence of burn area on fuel age and climatic variables. *International Journal of Wildland Fire* 12:1–10.
- Scott, J. M., F. W. Davies, B. Custi, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. Derchia, T. C. Edwards, J. Ulliman, and R. G. Wright. 1993. Gap analysis: a geographic approach to protection of biological diversity. *Wildlife Monographs* 123:1–41.
- Scott, J. M., F. W. Davies, R. G. McGhie, R. G. Wright, C. Groves, and J. Estes. 2001. Nature reserves: do they capture the full range of America's biological diversity? *Ecological Applications* 11:999–1007.
- Seabloom, E. W., E. T. Borer, V. L. Boucher, R. S. Burton, K. L. Cottingham, L. Goldwasser, W. K. Gram, B. E. Kendall, and F. Micheli. 2002. Competition, seed limitation, disturbance, and reestablishment of California native annual forbs. *Ecological Applications* 13:575–592.
- Semlitsch, R. D., and J. R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology* 17:1219–1228.
- Shainsky, L.J. and S.R. Radosevich. 1986. Growth and water relations of *Pinus ponderosa* seedlings in competitive regimes with *Arctostaphylos patula* seedlings. *The Journal of Applied Ecology* 23(3):957–966.
- Singleton, Peter H.; Gaines, William L.; Lehmkuhl, John F. 2002. Landscape permeability for large carnivores in Washington: a geographic information system weighted-distance and least-cost corridor assessment. Res. Pap. PNW-RP-549. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 89 p.
- Smith, J. 2007. *Steelhead Distribution and Ecology in the Upper Pajaro River System (with Reach Descriptions and Limiting Factor Identification for the Llagas Creek Watershed 3 March 2002) and stream descriptions, habitat quality ratings, and limiting factors by reach for the Pajaro River and for the upper Pajaro River tributaries*. November. Revised Report to the Santa Clara Valley Water District. San José, CA. San José State University.
- Sotoyome Resource Conservation District. 2007. *Grazing Handbook: a guide for resource managers in coastal California*. September 2007. Santa Rosa, CA. 76 pp.
- Soule, M. E. (ed.). 1986. *Conservation Biology: The Science of Scarcity and Diversity*. Sunderland, MA: Sinauer Associates.
- Soule, M. E., and B. A. Wilcox (eds.). 1980. *Conservation Biology: an Evolutionary-Ecological Perspective*. Sunderland, MA: Sinauer Associates.

- Spencer, W. D., S. J. Barry, S. R. Beissinger, J. L. Florsheim, S. Harrison, K. A. Rose, J. J. Smith, R. R. White. 2006. Report of Independent Science Advisors for Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP). December. Available: <<http://www.dfg.ca.gov/nccp/index.html>>.
- Starfield, A.M. and A.L. Bleloch. 1991. *Building Models for Conservation and Wildlife Management*. Second edition, The Burgess Press, Edina, Minnesota.
- State of California. 1985. *Henry Coe State Park General Plan*. Volume I. State of California—The Resources Agency Department of Parks and Recreation. October. 124 pp.
- Stillwater Sciences. 2006. *Upper Penitencia Creek Limiting Factors Analysis*. Final technical report. Prepared by Stillwater Sciences, Berkeley, California for Santa Clara Valley Urban Runoff Pollution Prevention Program, Oakland, California.
- Stromberg, M., and J. R. Griffin. 1996. Long-term patterns in coastal California grasslands in relation to cultivation, gophers, and grazing. *Ecological Applications* 6:1189–1211.
- Sweitzer, R. A., and D. H. Van Vuren. 2002. Rooting and foraging effects of wild pigs on tree regeneration and acorn survival in California's oak woodland ecosystem. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station.
- Sweitzer, R. A., and R. E. Loggins. 2001. *Wild Pig Management Plan for Henry W. Coe State Park*. Submitted to California Department of Parks and Recreation, Four Rivers District.
- Tetra Tech, Inc. 2006. *Upper Llagas Creek Riparian Corridor Assessment*. Prepared for the Santa Clara Valley Water District. January. Santa Clara County, CA.
- The Nature Conservancy. 2004. *Upper Pajaro River Floodplain Initial Assessment*. August 31. San Francisco, CA.
- The Nature Conservancy. 2006a. Map of regional linkages, Mount Hamilton project area. November 28. San Francisco, CA.
- The Nature Conservancy. 2006b. California Central Coast Ecoregional Plan Update. October. San Francisco, CA.
- Thomas Reid Associates, D. Murphy, R. Thornton, and N. E. Matteoni. 1985. *Conservation Plan for Bay Checkerspot Butterfly* (*Euphydryas editha bayensis*). Kirby Canyon Landfill Project. July 15.

- Thorne, J.H., D. Cameron, and V. Jigour. 2002. *A Guide to Wildlands Conservation in the Central Coast Region of California*. California Wilderness Coalition. July. 144 pp. Available: <<http://cain.ice.ucdavis.edu/repository/CC.pdf>>.
- Trenham, P. C., and H. B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. *Ecological Applications* 15:1158–1168.
- Tyler, C. M., B. E. Mahall, F. W. Davis, and M. Hall. 2002. Factors limiting recruitment in valley and coast live oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station.
- U.S. Fish and Wildlife Service. 1998a. *Recovery Plan for Upland Species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.
- U.S. Fish and Wildlife Service. 1998b. *Draft Recovery Plan for the Least Bell's Vireo*. U.S. Fish and Wildlife Service, Portland, Oregon. 139 pp.
- U.S. Fish and Wildlife Service. 1998c. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. U.S. Fish and Wildlife Service, Portland, Oregon. 330+ pp.
- U.S. Fish and Wildlife Service. 2000. 5-Point Policy to be included in HCPs. *Federal Register* 65:35242. June 1, 2000.
- U.S. Fish and Wildlife Service. 2002. *Recovery Plan for the California Red-Legged Frog*. U.S. Fish and Wildlife Service, Portland, Oregon. viii + 173 pp.
- U.S. Fish and Wildlife Service. 2005. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the California Tiger Salamander, Central Population, Final Rule. *Federal Register* 70(162):49380–49458. August 23.
- U.S. Fish and Wildlife Service. 2006a. *Status Review of the Least Bell's Vireo*. U.S. Fish and Wildlife Service, Portland, Oregon.
- U.S. Fish and Wildlife Service. 2006b. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the California Red-Legged Frog and Special Rule Exemption Associated With Final Listing for Existing Routine Ranching Activities, Final Rule. *Federal Register* 71(71):19244–19346. April 13.

- U.S. Fish and Wildlife Service. 2008. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydrya editha bayensis*), Final Rule. *Federal Register* 73(176):50406–50452. August 26.
- U.S. Fish and Wildlife Service. 2010. *Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-Legged Frog*. Final Rule. 75(51): 12816 –12959.)
- U.S. Fish and Wildlife Service. 2011. *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation*. Sacramento, CA.
- Walther, G.-R., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J.-M. Fromentin, O. Hoegh-Guldberg and F. Barlein. 2002. Ecological responses to recent climate change. *Nature* 416: 389-395.
- Weiss, S. B., and D. H. Wright. 2005. *Serpentine Vegetation Management Project 2005 Report*. (FWS Grant Agreement No 814205G240.) Menlo Park, CA.
- Weiss, S. B., and D. H. Wright. 2006. *Serpentine Vegetation Management Project 2006 Interim Report*. (FWS Grant Agreement No 814205G240.) Menlo Park, CA.
- Weiss, S. B., D. D. Murphy, and R. R. White. 1988. Sun, slope, and butterflies: Topographic determinants of habitat quality for *Euphydryas editha*. *Ecology* 69:1486–1496.
- Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13:1476–1486.
- Wetlands Research Associates. 2008. Ranch at Silver Creek Annual Monitoring Report. Wetland Research Associates, San Rafael, CA prepared for Ranch at Silver Creek.
- Whittall, Justen. 2008. Program Performance Report: 1<sup>st</sup> Annual Report: Determining the optimal conditions for propagation and reproduction of the endangered serpentine endemic Metcalf jewelflower (*Streptanthus albidus* ssp. *albidus*) of Santa Clara County and genetic assessment of its taxonomic status. Santa Clara, CA. Prepared for program funders.
- Whittall, Justen. 2011. Determining the optimal conditions for propagation and reproduction of the endangered serpentine endemic Metcalf Jewelflower (*Streptanthus albidus* ssp. *albidus*) of Santa Clara County and genetic assessment of its taxonomic status. Santa Clara, CA. Prepared for program funders.
- Wild, C. 2002. San Francisco Bay Area Gap Analysis: A Preliminary Assessment of Priorities for Protecting Natural Communities. Prepared for the California State Coastal Conservancy, Oakland, CA.



WRA Environmental Consultants. 2008. Delineation of Areas Meeting Wetland and Other Waters Criteria: Day Ranch and Lucky Hereford Ranch, Santa Clara County, California. Prepared for Lucky Day Ranch California Partnership, Santa Clara, CA. March.

Zedler, P. H., C. R. Gautier, and G. S. McMaster. 1983. Vegetation change in response to extreme events: the effect of a short interval between fires in California chaparral and coastal scrub. *Ecology* 64:809–818.

Zervas, G. 1998. Quantifying and optimizing grazing regimes in Greek mountain systems. *Journal of Applied Ecology*. 35:983–986.

## 13.5.2 Personal Communications

Coletto, Henry. Santa Clara County game warden, California Department of Fish and Game (retired). Winter/spring 2007—phone conversations with Troy Rahmig, Jones & Stokes.

Diamond, Tanya. M.S. candidate. Department of Biological Sciences, San José State University. Phone conversations with Troy Rahmig, Jones & Stokes. Winter/spring 2007.

Fields, Justin. Tulare Hill/Coyote Ridge rancher. SCC Cattlemen's Association. March 2007—telephone conversation.

Gonsolin, E. 2010. Biologist. San José State University. March 2010—telephone conversation with Cori Mustin, U.S. Fish and Wildlife Service.

Gray, George. Senior state park resource ecologist, Monterey District. California Department of Parks and Recreation, Monterey, CA. July 2006—meeting with David Zippin and Ken Schreiber.

Hillman, Janell. 2006. Botanist. Santa Clara Valley Water District. December 2006, February 2007, and January 2010—meetings and e-mails.

Hillman, Janell. 2007. Botanist. Santa Clara Valley Water District. December 12, 2007—e-mail to Terah Donovan of Jones & Stokes.

Hillman, Janell. 2009. Botanist. Santa Clara Valley Water District. May 8, 2007—email correspondence with Kate Bode of ICF Jones & Stokes.

Hillman, Janell. 2010. Botanist. Santa Clara Valley Water District. September 15, 2010—e-mail to Rebecca Sloan of ICF.

Koopmann, Tim. Range manager. San Francisco Public Utility Commission, San Francisco, CA. July 7, 2003—conversation with Joel Gerwein (Jones & Stokes).

- Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.
- Niederer, Christal. Botanist. Creekside Center for Ecosystem Observations, Menlo Park, CA. July 27<sup>th</sup>, 2010—E-mail exchange with Rebecca Sloan (Jones & Stokes).
- Patrie, Bob. President of the Pine Ridge Association. February 16, 2008—conversation with Troy Rahmig (Jones & Stokes).
- Rocha, Don. County of Santa Clara Parks & Recreation Department. April 27, 2010—e-mail to Kathryn Gaffney, ICF International.
- Serpa, Larry. Ecologist. The Nature Conservancy, Central Coast Region. May 10, 2007—Conversation with Troy Rahmig (Jones & Stokes).
- Weiss, Stuart. Biologist. Creekside Center for Earth Observation. February 2006 phone conversation and December 2006 meeting.
- Whittall, Justin. Biology Professor, Santa Clara University. February 4, 2010 Phone conversation with Kate Bode, Plant Ecologist, ICF international.

## 13.6 Chapter 6

### 13.6.1 Printed References

- Barnum, S.A. 2003. Identifying the best locations to provide safe highway crossing opportunities for wildlife. In C. L. Irwin, P. Garrett, and K. P. McDermott (eds.), *Proceedings of the International Conference on Ecology and Transportation*. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University.
- Brososke, K.D., J. Chen, R.J. Naiman, and J.F. Franklin. 1997. Harvesting effects on microclimate gradients from small streams to uplands in western Washington. *Ecological Applications* 7:1188-1200
- Buhlmann, K.A., 1998. Ecology, terrestrial habitat use, and conservation of freshwater turtle assemblage inhabiting a seasonally fluctuating wetland with emphasis on the life history of *Deirochelys reticularia*. Ph.D Dissertation, University of Georgia, Athens. 176 pp.
- Burbrink, F.T., C.A. Phillips, and E.J. Heske. 1998. A riparian zone in southern Illinois as a potential dispersal corridor for reptiles and amphibians. *Biological Conservation*. 86: 107-115.

- California Burrowing Owl Consortium, The. 1993. *Burrowing Owl Survey Protocol and Mitigation Guidelines*. Prepared by The California Burrowing Owl Consortium. April. Available at: <http://www.dfg.ca.gov/wildlife/nongame/docs/boconsortium.pdf>. Accessed on: November 4, 2009.
- California Department of Fish and Game. 1995. *Staff Report on Burrowing Owl Mitigation*.
- California Department of Fish and Game. 2003. List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database. September 6 edition.
- California Department of Fish and Game. 2012. *Staff Report on Burrowing Owl Mitigation*. March. Available: <http://www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. Accessed: June 24, 2012.
- California Native Plant Society. 1998. *Statement Opposing Transplantation as Mitigation for Impacts to Rare Plants*. July 9. Available: <http://www.cnps.org/archives/transplanting2.pdf>.
- California Sustainable Wine Growing Alliance. 2002a. Sustainable Winegrowing Practices. October 2002. Available: <http://www.wineinstitute.org/files/ErosionControl2002.pdf>. Accessed: February 26, 2008.
- California Sustainable Wine Growing Alliance. 2006. Sustainable Winegrowing Practices. Fall 2006. Available: <http://www.wineinstitute.org/files/animals&pestmanagement.pdf>. Accessed: February 26, 2008.
- Castelle, A. J., C. Conolly, M. Emers, E. D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, S. S. Cooke. 1992. Wetland buffers: use and effectiveness. Adolfson Associates, Inc., Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia, Pub. No. 92-10.
- Castelle, A.J., A.W. Johnson, and C. Conolly. 1994. Wetland and Stream Buffer Size Requirements—A Review. *Journal of Environmental Quality* 23:878-882.
- Chapel, M., Craig, D, Reynolds, M., et al. 1991. Review of Literature Addressing Wildlife and Fish Habitat Relationships in Late-Seral-Stage Coniferous Forests. Tahoe National Forest, Old Forest and Riparian Habitat Planning Project.
- City of Gilroy. 2004. *Storm Water Management Plan*. Gilroy, CA.
- City of Morgan Hill. 2003. Citywide Burrowing Owl Habitat Mitigation Plan. June.

- City of Morgan Hill. 2004. *Stormwater Management Plan*. Morgan Hill, CA.
- City of Morgan Hill. 2008. *Stormwater Management Plan*. Available: <http://www.morgan-hill.ca.gov/html/gov/pw/swmp.asp>. Accessed: February 12, 2008.
- City of San José. 2000. Draft Burrowing Owl Habitat Conservation Strategy and Implementation Plan.
- Corley, C.J., G.W. Frasier, M.J. Trlica, F.M. Smith, and E.M. Taylor. 1999. Technical Note: Nitrogen and Phosphorus in Runoff from two Montane Riparian Communities. *Journal of Range Management* 52:600-605.
- County of Santa Clara. 1994. *Santa Clara County General Plan: Charting a Course for Santa Clara County's Future: 1995–2010*. Adopted December 20, 1994. San José, CA.
- County of Santa Clara. 2009. *Integrated Landscape Guidelines*. Santa Clara County Planning Office, a division of the Department of Planning and Development, with technical assistance from ICF Jones & Stokes, Inc. Adopted by the Santa Clara County Planning Commission April 2, 2009. Available: [http://www.sccgov.org/SCC/docs/Planning,%20Office%20of%20\(DEP\)/attachments/Landscape.pdf](http://www.sccgov.org/SCC/docs/Planning,%20Office%20of%20(DEP)/attachments/Landscape.pdf). Accessed: May 20, 2009.
- Debano, L.F., and L.J. Schmidt. 1989. Improving southwestern riparian areas through watershed management. U.S. Forest Service General Technical Report RM-182, Ft. Collins, CO.
- Desbonnet, A., P. Pogue, V. Lee and N. Wolf. 1994. Vegetated buffers in the coastal zone: A summary review and bibliography. Providence, RI: University of Rhode Island.
- Fiedler, P. L., and R. D. Laven. 1996. Selecting reintroduction sites. Pages 157–170 in D. A. Falk, C. I. Millar, and M. Olwell (eds.), *Restoring Diversity: Strategies for Reintroduction of Endangered Plants*. St. Louis, MO: Center for Plant Conservation, and Covelo, CA: Island Press.
- Finch, G. 2004. *Critter Crossings: Linking Habitats and Reducing Roadkill*. (Federal Highway Administration Publication No: FHWA-EP-004.) Available: <http://www.fhwa.dot.gov/environment/wildlifecrossings/>.
- Fishery Network of Central California Coastal Counties (FishNet 4C), MFG, Inc., and Pacific Watershed Associates. 2004. *County Road Maintenance Guidelines for Protecting Aquatic Habitat and Salmon Fisheries*. Funded by: FishNet 4C Counties (Mendocino, Sonoma, Marin, San Mateo, Santa Cruz and Monterey counties), California Department of Fish and Game, National Marine Fisheries Service, and California Resources Agency. December 2004. Update 2007. Available: [http://www.fishnet4c.org/projects\\_roads\\_manual.html](http://www.fishnet4c.org/projects_roads_manual.html).

- Forman, R. T. T., D. Sperling, J. A. Bissonette, A. P. Clevenger, C. D. Cutshall, V. H. Dale, L. Fahrig, R. France, C. R. Goldman, K. Heanue, J. A. Jones, F. J. Swanson, T. Turrentine, and T. C. Winter. 2002. *Road Ecology: Science and Solutions*. Covelo, CA: Island Press.
- Hagar, J. C. 1999. Influence of Riparian Buffer Width on Bird Assemblages in Western Oregon. *Journal of Wildlife Management* 63:484–496.
- Hilty, J.A., W.C. Lidicker Jr., and A.M. Merenlender. 2006. *Corridor Ecology: The Science and Practice of Linking Landscapes for Biodiversity Conservation*. Covelo, CA: Island Press.
- Hodges, M.F. Jr. and D. G. Kremetz. 1996. Neotropical migratory breeding bird communities in riparian forests of different widths along the Altamaha River, Georgia. *Wilson Bulletin* 108 (3): 495-506.
- Howald, A. M. 1996. Translocation as a mitigation strategy: lessons from California. Pages 293–330 in D. A. Falk, C. I. Millar, and M. Olwell (eds.), *Restoring Diversity: Strategies for Reintroduction of Endangered Plants*. St. Louis, MO: Center for Plant Conservation, and Covelo, CA: Island Press.
- Irwin, C. L, P. Garrett, and K .P. McDermott (eds.). 2003. *Proceedings of the International Conference on Ecology and Transportation*. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University. Available: [http://www.icoet.net/ICOET\\_2003/03proceedings.html#>](http://www.icoet.net/ICOET_2003/03proceedings.html#>).
- Johnson, A. W., and D. M. Ryba. 1992. A literature review of recommended buffer widths to maintain various functions of stream riparian areas. King County Department of Natural Resources, Water and Land Resources Division, Seattle, WA.
- Kelly, P.A., and J.T. Rotenberry. 1993. Buffer zones for ecological reserves in California: replacing guesswork with science. In J. E. Keeley (ed.), *Interface between Ecology and Land Development in California*. Los Angeles: Southern California Academy of Sciences.
- Kilgo, J. C., R. A. Sargent, B.R. Chapman, K. V. Miller. 1998. Effect of strand width and adjacent habitat on breeding bird communities in bottomland hardwoods. *Journal of Wildlife Management* 62 (1): 72-83.
- Ligon, F. K., A. A. Rich, G. Rynearson, D. Thornburgh, and W. Trush. 1999. Report of the scientific review panel on California's forest practice rules and salmonid habitat. The California Resources Agency and the National Marine Fisheries Service, Sacramento, CA.
- Lowrance, R., R. Todd, J. Fail, Jr., O. Hendrickson, Jr., R. Leonard, and L. Asmussen. 1984. Riparian forests as nutrient filters in agricultural watersheds. *BioScience* 34:374-377

- Lynch, J.A. and E.S. Corbett. 1990. Evaluation of Best Management-Practices for Controlling Nonpoint Pollution from Silvicultural Operations. *Water Resources Bulletin*. 1990. 26(1): p. 41-52.
- Matheny, N. and J. R. Clark. 1998. *Trees and Development: A Technical Guide to Preservation of Trees during Land Development*. Champaign, IL: International Society of Arboriculture. 183 p
- MHA Environmental Consulting. 2007. Santa Clara Valley Water District Pipeline Maintenance Program Final Program Environmental Impact Report. Prepared for the Santa Clara Valley Water District. September. San Mateo, CA.
- Mitchell, F., 1996. Vegetated Buffers for Wetlands and Surface Waters: Guidance for New Hampshire Municipalities. *Wetlands Journal* 8:4-8.
- New Hampshire Forest Sustainability Standards Work Team (NH FSSWT). 2000. Riparian buffers for the Connecticut River Watershed. Connecticut River Joint Commissions.
- Nichols, D.J., T.C. Daniel, D.R. Edwards, P.A. Moore, and D.H. Pote. 1998. Use of grass filter strips to reduce 17-estradiol in runoff from fescue-applied poultry litter. *Journal of Soil and Water Conservation* 53:74-77.
- O’Laughlin, J., and Belt, G. H. 1995. Functional approaches to riparian buffer strip design. *Journal of Forestry*. Feb. 1995. 29–32.
- Pacific Watershed Associates. 1994. Handbook for Forest and Ranch Roads: A Guide for planning, designing, construction, reconstructing, maintaining and closing wildland roads. Prepared for Mendocino County Resource Conservation District in cooperation with the California Department of Forestry and Fire Protection and the U.S.D.A. Soil Conservation Service. June.
- Petersen, R.C., L.B.M. Petersen, and J. Lacoursiere. 1992. A building block model for stream restoration. Pp. 293-309. In: *River Conservation and Management*., P.J. Boon, P. Calow and G.E. Petts (eds). Chichester: John Wiley.
- Rancho Santa Ana Botanic Garden. Seed Conservation Program. Claremont, CA. Available: <<http://www.rsabg.org/horticulture/seed-conservation-program>>. Accessed: July 2010.
- Richardson, C.T., C.K., Miller. 1997. Recommendations for protecting raptors from human disturbance: A review. *Wildlife Society Bulletin* 25: 634-638.
- Riparian Habitat Joint Venture (RHJV). 2000. Version 1.0. The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian Associated Birds in California. California Partners.

- Rosenberg, D.K., B.R. Noon, and E.C. Meslow. 1997. Biological Corridors: Form, Function, and Efficacy. *BioScience* 47:677-687.
- Rudolph, D.C. and J.G. Dickson. 1990. Streamside zone width and amphibian and reptile abundance. *Southwest Naturalist*: 35; 472-476.
- San Francisco Estuary Institute. 2006. *Coyote Creek Historical Ecology Study*. January. Oakland, CA. Prepared for the Santa Clara Valley Water District. 230 pages.
- San Francisco Estuary Institute. 2008. South Santa Clara County Historical Ecology Study Including Soap Lake, The Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks. Final Report to the Santa Clara Valley Water District, San José, CA. May.
- Santa Clara Valley Urban Runoff Pollution Prevention Program. 2006. (Updated). *C.3 Stormwater Handbook*. Santa Clara County, California: Santa Clara Valley Urban Runoff Pollution Prevention Program. <[www.svurppp.org](http://www.svurppp.org)>.
- Santa Clara Valley Water District. 2008. *Best Management Practices Handbook (W751M01)*. May 22. San José, CA.
- Santa Clara Valley Water Resources Protection Collaborative. 2006. User Manual: Guidelines & Standards for Land Use Near Streams: A Manual of Tools, Standards and Procedures to Protect Streams and Streamside Resources in Santa Clara County. July. Available: <[http://www.valleywater.org/Water/Watersheds/\\_streams\\_and\\_floods/Taking\\_care\\_of\\_streams/\\_Guidelines\\_&\\_standards/Guidelines\\_&\\_Standards.shtm](http://www.valleywater.org/Water/Watersheds/_streams_and_floods/Taking_care_of_streams/_Guidelines_&_standards/Guidelines_&_Standards.shtm)>.
- Schellinger, G. and J. Clausen. 1992. Vegetative filter treatment of dairy barnyard runoff in cold regions. *Journal of Environmental Quality*. 9:483-497.
- Semlitsch, R.D. 1998. Biological delineation of terrestrial buffer zones for pond breeding salamanders. *Conservation Biology* 12: 113-119.
- Spackman, S. C., and J. W. Hughes. 1995. Assessment of Minimum Stream Corridor Width for Biological Conservation: Species Richness and Distribution along Mid-Order Streams in Vermont, USA. *Biological Conservation* 71:325-332.
- Spence, B.C., G.A. Lomnický, R.M. Huges, and R.P. Novitzki. 1996. An ecosystem approach to salmoid sonervation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. *Habitat Conservation Planning Handbook, as Amended*. November. Amended June 2000. Washington, DC.

- U.S. Fish and Wildlife Service. 2001. *Least Bell's Vireo Survey Guidelines*. January 19. Carlsbad, CA. Available: [http://www.fws.gov/Ventura/speciesinfo/protocols\\_guidelines/docs/lbv/leastbellsvireo\\_survey-guidelines.pdf](http://www.fws.gov/Ventura/speciesinfo/protocols_guidelines/docs/lbv/leastbellsvireo_survey-guidelines.pdf). Accessed: April 8, 2010.
- U.S. Fish and Wildlife Service. 2005. Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog: Appendix B, Recommended Equipment Decontamination Procedures. August. Available: [http://www.fws.gov/sacramento/es/documents/crf\\_survey\\_appendix\\_B\\_decontamination.PDF](http://www.fws.gov/sacramento/es/documents/crf_survey_appendix_B_decontamination.PDF). Accessed: April 26, 2010.
- U.S. Fish and Wildlife Service. 2009. A system for mapping riparian areas in the western United States. U.S. Dept. of the Interior, Fish and Wildlife Service, Division of Habitat and Resource Conservation, Branch of Resource and Mapping Support, Arlington, VA. Available: [http://www.fws.gov/wetlands/\\_documents/gOther/SystemMappingRiparianAreasWesternUS2009.pdf](http://www.fws.gov/wetlands/_documents/gOther/SystemMappingRiparianAreasWesternUS2009.pdf). Accessed: November 2009.
- U.S. Fish and Wildlife Service. 2011. Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox prior to or during Ground Disturbance. January 2011. Available: [http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/kitfox\\_standard\\_rec\\_2011.pdf](http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/kitfox_standard_rec_2011.pdf). Accessed: June 25, 2012.
- Welsch, D.J. 1991. Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources. Forest Resource management, Northeastern Area, State and Private Forestry USDA Forest Service, Radnor, Pennsylvania.
- Whitaker, D.M., W.A. Montevecchi. 1999. Breeding bird assemblages inhabiting riparian strips in Newfoundland, Canada. *Journal of Wildlife Management* 63:167-179
- Woodward, S.E., and C.A. Rock. 1995. Control of residential stormwater by natural buffer strips. *Lake and reservoir Management* 11(1):37-45.

## 13.7 Chapter 7

### 13.7.1 Printed References

- Arcadis. 2008. Survey and Baseline Monitoring of Special Status Plants on Serpentine Habitat, United Technologies Corporation—Pratt and Whitney Rocketdyne Facility. October.



- Atkinson, A. J., P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore. 2004. *Designing Monitoring Programs in an Adaptive Management Context for Multiple Species Conservation Plans*. (U.S. Geological Survey Technical Report.) Sacramento, CA: U.S. Geological Survey Western Ecological Research Center.
- Barclay, J. H. 2008. A simple artificial burrow design for burrowing owls. *Journal of Raptor Research*. 42: 53-57.
- Bartolome, J. W., M. P. McClaren, B. H. Allen-Diaz, J. Dunne, L. D. Ford, R. B. Standiford, N. K. McDougald, and L. C. Forero. 2002. Effects of Fire and Browsing on Regeneration of Blue Oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR- 184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.
- Bobzien, S., and J.E. DiDonato. 2007. The status of the California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), Foothill Yellow-Legged Frog (*Rana boylei*), and other aquatic herpetofauna in the East Bay Regional Park District, California. East Bay Regional Park District 2007.
- Borchert, M. I., F. W. Davis, J. Michaelson, and L. D. Oyler. 1989. Interactions of Factors Affecting Seedling Recruitment of Blue Oak (*Quercus douglasii*) in California. *Ecology* 70:389–404.
- Bulger, J. B., N. J. Scott Jr., and R. B. Seymour. 2003. Terrestrial Activity and Conservation of Adult California Red-Legged Frogs (*Rana aurora draytonii*) in Coastal Forests and Grasslands. *Biological Conservation* 110:85–95.
- Bullock, J. M., K. Shea and O. Skarpaas. 2006. Measuring plant dispersal: an introduction to field methods and experimental design. *Journal of Plant Ecology*. Volume 186: 217-234
- California Burrowing Owl Consortium, The. 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. April. Available: <<http://www.dfg.ca.gov/wildlife/nongame/docs/boconsortium.pdf>>. Accessed: May 2009.
- Carignan, V. and M.A. Villard. 2004. Indicator species in environmental monitoring programs: conceptual and operational considerations. Pages 567–582 in: Wiersma, G.B. (ed.). *Environmental Monitoring*. CRC Press, Boca Raton, FL.
- Carignan, V., and M.A. Villard. 2002. Selecting Indicator Species to Monitor Ecological Integrity: a Review. *Environmental Monitoring and Assessment* 78:45–61.

- Caro, T. M., and G. O'Doherty. 1999. On the Use of Surrogate Species in Conservation Biology. *Conservation Biology* 13:805–814
- Chase, M.K., W.B. Kristan, A.J. Lyman, M.V. Price, and J.T. Rotenberry. 2000. Single Species as Indicators of Species Richness and Composition in California Coastal Sage Scrub Birds and Small Mammals. *Conservation Biology* 14(2): 474–487. Dale, V., Joyce, L., McNulty, S., Neilson, R., Ayres, M., Flannigan, M., Hanson, P., Irland, L., Lugo, A., Peterson, C., Simberloff, D., Swanson, F., Stocks, B., Wotton, B. 2001. Climate Change and Forest Disturbances. *BioScience* 51:9: 723–734.
- Coachella Valley Association of Governments. 2007. Coachella Valley Multiple Species Habitat Conservation Plan. September. Available: <[http://www.cvmshcp.org/Plan\\_Documents.htm](http://www.cvmshcp.org/Plan_Documents.htm)>.
- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. *Measuring and Monitoring Plant Populations*. (U.S. Bureau of Land Management Technical Reference 1730-1.) Washington, DC.
- Evens, J., and S. San. 2004. Vegetation Associations of a Serpentine Area: Coyote Ridge, Santa Clara County, California. Sacramento, CA: California Native Plant Society.
- Fleishman, E., D. D. Murphy, and P. F. Brussard. 2000. A New Method for Selection of Umbrella Species for Conservation Planning. *Ecological Applications* 10:569–579.
- Gibbs, J. P., H. L. Snell, C. E. Causton. 1999. Effective Monitoring for Adaptive Wildlife Management: Lessons from the Galapagos Islands. *The Journal of Wildlife Management* 63(4):1055–1065
- Griffin, J. R. 1977. Oak Woodland. Pages 383–415 in M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. New York: Wiley and Sons.
- Grossinger, R. M., R. A. Aaskevold, C. J. Striplen, E. Brewster, S. Pearce, K. N. Larned, L. J. McKee, and J. N. Collins. 2006. *Coyote Creek Watershed Historical Ecology Study: Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. (SFEI Publication 426.) Oakland, CA: San Francisco Estuary Institute. Prepared for the Santa Clara Valley Water District.
- Hanes, T. L. 1988. California chaparral. Pages 417–469 in M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. Sacramento, CA: California Native Plant Society.
- Harrison, S. 1989. Long-distance dispersal and colonization in the Bay checkerspot butterfly, *Euphydryas editha bayensis*. *Ecology* 70: 1236–1243.

- Hellmann, J.J. 2002. Butterflies as model systems for understanding and predicting the biological effects of climatic change. S.H. Schneider and T.L. Root, (eds.), *Wildlife responses to climate change*. Island Press: Washington, D.C. pp. 93–126.
- Hillman, J. 2007. Constraints on population recruitment for a rare serpentine seep thistle. Master's thesis, San Francisco State University. San Francisco, CA.
- Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Vegetation of California*. Sacramento, CA: California Resources Agency, Department of Fish and Game.
- Hurlbert, S. H. 1984. Pseudoreplication and the Design of Ecological Field Experiments. *Ecological Monographs* 54:187–211.
- Jones & Stokes. 1995. Valley Oak and Riparian Woodland Habitat Mitigation (Mitigation Area 1, Phase 1) for the Los Vaqueros Project. Volumes 1 and 2: Bidding and Contract Requirements, General Requirements, Technical Specifications, and Appendices. (JSA 94-184.) Sacramento, CA. Prepared for Contra Costa Water District, Concord, CA.
- Jones & Stokes. 2002. Water year 2001 mitigation monitoring report for the Guadalupe River Project, downtown San Jose, California. Final. August. (J&S 02-076.) Sacramento, CA. Prepared for U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA, in coordination with Santa Clara Valley Water District, San Jose, CA.
- Kati, V., P. Devillers, M. Dufrene, A. Legakis, D. Vokou, and P. Lebrun. 2004. Testing the Value of Six Taxonomic Groups as Biodiversity Indicators at a Local Scale. *Conservation Biology* 18:667–675.
- Lancia, R. A., J. W. Bishir, M. C. Conner, and C. S. Rosenberry. 1996. Use of Catch-Effort to Estimate Population Size. *Wildlife Society Bulletin* 24:731–737.
- Landres, P. B., J. Verner, and J. W. Thomas. 1988. Ecological Uses of Vertebrate Indicator Species: A Critique. *Conservation Biology* 2:316–328.
- Launer, A.E., and D. D.Murphy. 1994. Umbrella species and the conservation of habitat fragments: a case of a threatened butterfly and a vanishing grassland ecosystem. *Biological Conservation* 69:145–153.
- Lawler, S.P., D.D. Dritz, T. Strange, and M. Holyoak. 1999. Effects of Introduced Mosquitofish and Bullfrogs on Threatened California Red-legged Frog. *Conservation Biology*. 13(3): 613-622.
- Lindenmayer, D.B., C.R. Margules, and D.B. Botkin. 2000. Indicators of Biodiversity for Ecologically Sustainable Forest Management. *Conservation Biology* 14:941–950.

- MacNally, R., and E. Fleishman. 2004. A Successful Predictive Model of Species Richness Based on Indicator Species. *Conservation Biology* 18:646– 654.
- Martin, J., Kitchen, W.M., and James, E.H. 2007. Importance of Well-designed Monitoring Programs for the Conservation of Endangered Species: Case Study of the Snail Kite. *Conservation Biology*. 21(2):472–481.
- National Research Council. 2000. *Ecological Indicators for the Nation*. Washington, DC: National Academy Press. Available: <<http://www.nap.edu/openbook.php?isbn=0309068452>>.
- Noss, R.F. 1999. Assessing and Monitoring Forest Biodiversity: a Suggested Framework and Indicators. *Forest Ecology and Management* 115:135–146.
- Oakley, K.L., L.P. Thomas, and S.G. Fancy. 2003. Guidelines for Long-Term Monitoring Protocols. *Wildlife Society Bulletin* 31:1000–1003. Available: <<http://science.nature.nps.gov/im/monitor/protocols/protocolguidelines.pdf>>.
- Opperman, J.J., and Merelender, A.M. 2004. Improving In-Stream Fish Habitat in Four Hardwood-dominated California Streams. *North American Journal of Fisheries Management*. 24:822–834.
- Pavlik, B.M., P.C. Muick, S.G. Johnson, and M. Popper. 1991. *Oaks in California*. Los Olivos, CA: Cachuma Press.
- Pollock, K.H., J.D. Nichols, T.R. Simons, G.L. Farnsworth, L.L. Bailey, and J.R. Sauer. 2002. Large Scale Wildlife Monitoring Studies: Statistical Methods for Design and Analysis. *Environmetrics*. 13:105–119
- Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, D.F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 41 p.
- Rathbun, G.B. and T.G. Murphy. 1996. Evaluation of a Radio-Belt for Ranid Frogs. *Herpetological Review* 27(4):197–189.
- Reese, Devin A. 1996. Comparative Demography and Habitat Use of Western Pond Turtles in Northern California: The Effects of Damming and Related Alterations. Unpublished PhD Dissertation: University of California at Berkeley. 253 pp.
- San Francisco Estuary Institute. 2008. South Santa Clara County Historical Ecology Study Including Soap Lake, The Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks. Final Report to the Santa Clara Valley Water District, San José, CA. May.
- Santa Clara Valley Audubon Society. 2005. Checklist of the Birds of Santa Clara County. Updated March 31, 2005. Available: <<http://www.scvas.org/pdf/checklist.pdf>>. Accessed: June 2008.

- Santa Clara Valley Transportation Authority. 2006. *VTA-Coyote Ridge Resource Management Plan*. June. H.T. Harvey and Associates and Creekside Center for Earth Observation.
- Santa Clara Valley Water District. 2005. *Biodiversity Monitoring Program-Stream Maintenance Program-Best Management Practice 3.19*. January.
- Scheiner, S.M., and J. Gurevitch (eds.). 1993. *Design and Analysis of Ecological Experiments*. New York, NY: Chapman & Hall.
- Schoenherr, A.A. 1992. *A Natural History of California*. (California Natural History Guide 56.) Berkeley, CA: University of California Press.
- Seltenrich, C.P. and A.C. Pool. 2002. A standardized approach for habitat assessments and visual encounter surveys for the foothill yellow-legged frog (*Rana boylei*). Pacific Gas and Electric Company.
- Sweitzer, R.A., and D.H. Van Vuren. 2002. Rooting and Foraging Effects of Wild Pigs on Tree Regeneration and Acorn Survival in California's Oak Woodland Ecosystem. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.
- Trenham, P.C., and H.B. Shaffer. 2005. Amphibian Upland Habitat Use and Its Consequences for Population Viability. Ecological Society of America. Davis, CA. *Ecological Applications*, 15(4), 2005, pp. 1158–1168.
- Tyler, C.M., B.E. Mahall, F.W. Davis, and M. Hall. 2002. Factors Limiting Recruitment in Valley and Coast Live Oak. In R. B. Standiford, D. McCreary, and K. L. Purcell (technical coordinators), *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California's Changing Landscape*. October 22–25, 2001, San Diego, CA. (General Technical Report PSW-GTR-184.) Albany, CA: USDA Forest Service, Pacific Southwest Research Station.
- U.S. Army Corps of Engineers. 2001. Comprehensive Everglades Restoration Plan. March 29, 2001 (Revised 2003). Available: <<http://www.evergladesplan.org/>>.
- U.S. Fish and Wildlife Service. 1998. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area. U.S. Fish and Wildlife Service, Portland, Oregon. 330+ pp.
- U.S. Fish and Wildlife Service. 2005. *Revised guidance on site assessment and field surveys for California red-legged frogs (Rana aurora draytonii)*. Available: <<http://www.fws.gov/sacramento/es/protocol.htm>>. Accessed: May 2009.

- Vogl, R. J., Armstrong, W. P., White, K. L., and Cole, K. L. 1988. The Closed-Cone Pines and Cypresses. Pages 295–359 in M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. Sacramento, CA: California Native Plant Society.
- Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13:1476–1486.
- Weiss, S.B., and D.H. Wright. 2005. *Serpentine Vegetation Management Project 2005 Report*. (FWS Grant Agreement No 814205G240.) Menlo Park, CA
- Williams, B.K., C. Szaro, and D. Shapiro. 2007. *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Adaptive Management Working Group, U.S. Washington, DC: Department of the Interior.
- WRA Environmental Consultants. 2006. *Silver Creek Preserve Annual Monitoring Report Year Six*. San José, CA. Prepared for William Lyon Homes, Inc., Morgan Hill, CA.
- Yoccoz, N. G., J. D. Nichols, and T. Boulinier. 2001. Monitoring of Biological Diversity in Space and Time. *Trends in Ecology and Evolution* 16:446–453.

## 13.7.2 Personal Communications

- Bobzien, Steve. Ecological Services Coordinator, East Bay Regional Park District. May 2003.
- Johnson, Brenda. California Department of Fish and Game; Habitat Conservation Planning. December 14, 2007.
- Weiss, Stuart. Biologist. Creekside Center for Earth Observation. January 9, 2008—e-mail exchange with Troy Rahmig, Jones & Stokes.

# 13.8 Chapter 9

## 13.8.1 Printed References

- California Energy Commission. 2006. Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity. Prepared by University of California, Santa Barbara, and Creekside Center for Earth Observation. Public Interest Energy Research Program Publication CEC-500-2005-165. Available at <<http://www.energy.ca.gov/2005publications/CEC-500-2005-165/CEC-500-2005-165.PDF>>.

- County of Santa Clara, Parks and Recreation Department. 2003. *Santa Clara County Parks and Recreation System: Strategic Plan*. August 2003. Los Gatos, CA. p. 144.
- Environmental Laboratory. 1987. U.S. Army Corps of Engineers Wetlands Delineation Manual. (Technical Report Y-87-1.) Vicksburg, MS: U.S. Army Waterways Experience Station.
- Federal Housing Finance Agency. Consumer Price Index, All Items, base data year of 1982–1984, for all urban consumers (CPI-U), not seasonally adjusted. 1915 to 2009. Available: <<http://www.bls.gov/>>.
- U.S. Army Corps of Engineers. 2008. Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Arid West Region (Version 2.0). ERDC/EL TR-08-28. U.S. Army Engineer Research and Development Center, Vicksburg, MS.
- U.S. Bureau of Labor Statistics. Change in the annual House Price Index (HPI) for the San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area (MSA) for the prior calendar year. 1977 to 2009. Available: <<http://www.fhfa.gov/>>.

## 13.9 Chapter 10

### 13.9.1 Printed References

- Brown, K.J., and R.J. Hebda. 1998. Long-term fire incidence in coastal forests of British Columbia. *Northwest Science* 72(special issue 2):64–66.
- California Climate Change Center. 2006. *Climate Change Impact on Forest Resources*. March. (CEC-500-2005-193-SF.) Available: <<http://www.energy.ca.gov/2005publications/CEC-500-2005-193/CEC-500-2005-193-SF.PDF>>.
- California Natural Resources Agency. 2009. *2009 California Climate Adaptation Strategy*. Available: <<http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF>>. Accessed: July 2010
- Davis, F.W. and M.I. Borchert 2006. Central Coast Bioregion. Pages 321-349 in N.G. Sugihara, J.W. Van Wagtendonik, K.E. Shaffer, J. Fites-Kaufman, and A. E. Thode (eds.) *Fire in California's Ecosystems*. Berkeley, CA. University of California Press.
- Davis, M.B and R.G. Shaw. 2001. Range shifts and adaptive responses to Quaternary climate change. *Science* 292:173–180.

- Dean, B.V., R.L. Salstrom, J. Fiedler, B. Molnar, and K. Haake. 1994. Statistical and Simulation Analysis Assists Santa Clara Valley Water District Planning. The Institute of Management Sciences. *Interfaces* 24: 6 November–December 1994 (pp.82–99).
- Dettinger, M.D. and D.R. Cayan, M.K. Meyer, A.E. Jeton. 2004. Simulated hydrologic responses to climate variations and changes in the Merced, Carson, and American River basins, Sierra Nevada, California, 1900–2099. *Climate Change* 62:283–317.
- Dukes, J.S. and H.A. Mooney. 1999. Does global change increase the success of biological invaders? *Trends in Ecology and Evolution* 14(4):135–139.
- Easterling, D.R., G.A. Meehl; C. Parmesan; S.A. Changnon; T.R. Karl; L.O. Mearns. 2000. Climate extremes: observations, modeling, and impacts. *Science* (New Series) 289(5487):2068–2074.
- Forister, M.L., and A.M. Shapiro. 2003. Climactic trends and advancing spring flight of butterflies in lowland California. *Global Change Biology* 9:1130–1135.
- Fried, J.S., M.S. Torn, E. Mills. 2004. The impact of climate change on wildfire severity: a regional forecast for northern California. *Climactic Change* 64:169–191.
- Global Change Research Program. 2009. Global Change Impacts in the United States. Available: <<http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009>> Accessed: June 25,2012.
- Hayhoe, K., D. Cayan, C. B. Field, P. C. Frumhoff, E. P. Maurer, N. L. Miller, S. C. Moser, S. H. Schneider, K. Nicholas Cahill, E. E. Cleland, L. Dale, R. Drapek, R. M. Hanemann, L. S. Kalkstein, J. Lenihan, C. K. Lunch, R. P. Neilson, S. C. Sheridan, and J. H. Verville. 2004. Emissions pathways, climate change, and impacts on California. *Proceedings of the National Academy of Sciences of the United States of America* 101(34):12422–12427.
- Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds.). Cambridge, UK and New York, NY: Cambridge University Press. Available: <<http://www.ipcc.ch/ipccreports/ar4-wg1.htm>>.
- Kim, J. 2005. A projection of the effects of the climate change induced by increased CO<sub>2</sub> on extreme hydrologic events in the Western U.S. *Climatic Change* 68:153–168.



- Lenihan, J.M., R. Drapek, D. Bachelet, and R.P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. *Ecological Applications* 13(6):1667–1681.
- Luers, A., D. Cayan, G. Franco, M. Hanemann, and B. Croes. 2006. *Our Changing Climate: Assessing the Risks to California*. A Summary Report from the California Climate Change Center. CEC–500–2006–077.
- Martin, T. 1998. Are microhabitat preferences of coexisting species under selection and adaptive? *Ecology* 79(2):656–670.
- Millar, C.I., R. Neilson, D. Bachelet, R. Drapek, and J. Lenihan. 2006. Climate change at multiple scales. Pages 31–60 in Salwasser, H. and M. Cloughes (eds), *Forests, Carbon and Climate Change: A Synthesis of Science Findings*. Portland, OR: Oregon Forest Resources Institute.
- Murphy, D.D., and S.B. Weiss. 1992. Effects of climate change on biological diversity in Western North America: species losses and mechanisms. Pages 355–368 in R. L. Peters and T. E. Lovejoy (eds.), *Global Warming and Biological Diversity*. Castleton, NY: Hamilton Printing.
- National Research Council. 2010. America's Climate Choices: Panel on Advancing the Science of Climate Change; National Research Council. Available: <[http://www.nap.edu/catalog.php?record\\_id=12782](http://www.nap.edu/catalog.php?record_id=12782)>. Accessed June 25, 2012.
- Parmesan, C., N. Ryrholm, C. Stefanescu, J.K. Hill, C.D. Thomas, H. Descimon, B. Huntley, L. Kaila, J. Kullberg, T. Tammaru, W.J. Tennent, J.A. Thomas, and M. Warren. 1999. Poleward shifts in geographical ranges of butterfly species associated with regional warming. *Nature* 399:579–583.
- Pimm, S.L. 2001. Entrepreneurial insects. *Nature* 411:531–532.
- Pounds, J.A., M.R. Bustamente, L.A. Coloma, J.A. Consuegra, M.P.L. Fogden, P.N. Foster, E. La Marca, K.L. Masters, A. Merino-Viteri, R. Puschendorf, S.R. Ron, G.A. Sánchez-Azofeifa, C.J. Still, and B.E. Young. 2006. Widespread amphibian extinctions from epidemic disease driven by global warming. *Nature* 439:161–167.
- Rogers, D.L., and R.D. Westfall. 2007. Spatial genetic patterns in four old-growth populations of coast redwood. (USDA Forest Service General Technical Report PSW-GTR-194.) Pages 59–63 in Standiford, R. B., G. A. Giusti, Y. Valachovic, W. J. Zielinski, and M. J. Furniss (eds.), *Proceedings of the Redwood Region Forest Science Symposium: What Does the Future Hold?*, March 15–17, 2004, Rohnert Park, CA. Albany, CA: U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station. Available: <[http://www.fs.fed.us/psw/publications/westfall/psw\\_2007\\_westfall009.pdf](http://www.fs.fed.us/psw/publications/westfall/psw_2007_westfall009.pdf)>.

- Root, T.L., D.P. MacMynowski; M.D. Mastrandrea; S.H. Schneider. 2005. Human-modified temperatures induce species changes: joint attribution. *Proceedings of the National Academy of Sciences of the United States of America* 102(21):7465–7469.
- Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig, and J.A. Pounds. 2003. Fingerprints of global warming on wild animals and plants. *Nature* 421:57–60.
- Shainsky, L.J. and S.R. Radosevich. 1986. Growth and water relations of *Pinus ponderosa* seedlings in competitive regimes with *Arctostaphylos patula* seedlings. *The Journal of Applied Ecology* 23(3):957–966.
- Stuart, J.D. and S.L. Stephens 2006. North Coast Bioregion. Pages 147-169 in N.G. Sugihara, J.W. Van Wagtendonik, K.E. Shaffer, J. Fites-Kaufman, and A. E. Thode (eds.) *Fire in California's Ecosystems*. Berkeley, CA. University of California Press.
- Sugihara, N.G., J.W. Van Wagtendonik, and J. Fites-Kaufman. 2006. Pages 58-73 in N.G. Sugihara, J.W. Van Wagtendonik, K.E. Shaffer, J. Fites-Kaufman, and A. E. Thode (eds.) *Fire in California's Ecosystems*. Berkeley, CA. University of California Press.
- Thorne, J.H. 2006. Movement of the conifer belt on the Sierra Nevada over the last 140 years. PowerPoint presentation at the annual Climate Change Research Conference, Sacramento, CA, September 13–15, 2006.
- U.S. Fish and Wildlife Service. 2002. *Recovery Plan for the California Red-Legged Frog*. Portland, OR: U.S. Fish and Wildlife Service Region 1. Walther, G.-R., E. Post, P. Convey, A. Menzel, C. Parmesan, T. J. C. Beebee, J.-M. Fromentin, O. Hoegh-Guldberg, and F. Bairlein. 2002. Ecological responses to recent climate change. *Nature* 416:389–395.
- Walther, G.-R., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J.-M. Fromentin, O. Hoegh-Guldberg and F. Barlein. 2002. Ecological responses to recent climate change. *Nature* 416: 389-395.
- Westerling, A.L., B.P. Bryant, H.K. Preisler, H.G. Hidalgo, T. Das, and S.R. Shrestha. 2009. Climate Change, Growth and California Wildfire (Draft Report CEC-500-2009-046-D). Prepared for: California Climate Change Center. Available: <<http://www.energy.ca.gov/2009publications/CEC-500-2009-046/CEC-500-2009-046-D.PDF>>. Accessed: May 7, 2009.
- Willis, R. 2006. Central Valley Bioregion. Pages 295 - 320 in N.G. Sugihara, J.W. Van Wagtendonik, K.E. Shaffer, J. Fites-Kaufman, and A. E. Thode (eds.) *Fire in California's Ecosystems*. Berkeley, CA. University of California Press.

## 13.9.2 Personal Communications

Hillman, Janell M. Botanist. Santa Clara Valley Water District. December 12, 2007—e-mail to Terah Donovan of Jones & Stokes.

Hillman, Janell M. Botanist. Santa Clara Valley Water District. September 15, 2010.—Management partners meeting on September 9, 2010 and e-mail to Rebecca Sloan of ICF.

## 13.10 Chapter 11

### 13.10.1 Printed References

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. *Endangered Species Consultation Handbook*. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. March. Final. Available: <[http://www.nmfs.noaa.gov/pr/pdfs/laws/esa\\_section7\\_handbook.pdf](http://www.nmfs.noaa.gov/pr/pdfs/laws/esa_section7_handbook.pdf)>. Accessed: July 2010.

## Appendix A

# Glossary



## Definitions of Key Terms and Concepts

**Adaptive management.** A method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned (65 Federal Register 106 35242–35257, June 1, 2000).

**Anthropogenic.** Caused or produced through human agency.

**Bankfull.** The incipient elevation on the bank where flooding begins. In many stream systems, the bankfull stage is associated with the flow that just fills the channel to the top of its banks and at a point where the water begins to overflow onto a floodplain (Leopold et al. 1964). The bankfull stage and its attendant discharge serve as consistent morphological indices which can be related to the formation, maintenance and dimensions of the channel as it exists under the modern climatic regime.

**Baseline.** The existing environmental state, which includes past and present impacts as well as the anticipated impacts of all permitted projects in the inventory area.

**Biodiversity.** The variety of organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families, and higher taxonomic levels; includes the variety of natural communities and ecosystems.

**Biological opinion (BO).** The document stating the opinion of the U.S. Fish and Wildlife Service and/or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service as to whether or not a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (50 Code of Federal Regulations 402.02). A biological opinion is one of the decision documents of a consultation under Section 7 of the federal Endangered Species Act.

**Biological goals.** Guiding principles for conservation within the study area based on the conservation needs of the covered species and natural communities. The goals describe the vision for the covered species and natural communities to be achieved through implementation of a successful conservation program. Biological goals are typically qualitative rather than quantitative (65 Federal Register 106 35242–35257, June 1, 2000).

**Biological objectives.** Measurable targets that will be sought to achieve the biological goal. Biological objectives are typically quantitative or at least measurable (65 Federal Register 106 35242–35257, June 1, 2000).

**Broad goals (or program goals).** Broad guiding principles for the entire Plan. These goals represent a summary of the “project purpose and need” for the Plan and may be incorporated as a mission statement for the process and the plan. These are a different set of goals than the biological goals and objectives.

**Building permit.** A permit issued by a city or county under the applicable construction code (e.g., Uniform Building Code) that authorizes the construction of new or expanded structures. A building permit does not include permits issued under plumbing, electrical, mechanical or other regulations for construction work in new or expanded structures.

**CEQA species.** Plant and animal species that are considered endangered, threatened, or rare under the California Environmental Quality Act (CEQA) and thus must be considered in CEQA documents, but are not species covered by the Plan (670.2 or 670.5, Title 14, California Code of Regulations). See also *Endangered species* and *Threatened species*.

**Changed circumstances.** Changes in conditions or other circumstances affecting a covered species or the geographic area covered by the Plan that can reasonably be anticipated by the Permittees and that can reasonably be planned for in the Plan (e.g., new species listings, fire, or other reasonably foreseeable natural catastrophic events).

**City limits.** Official jurisdictional boundary of a city.

**Coastal and valley freshwater marsh.** Wetlands dominated by emergent herbaceous plants (reeds, sedges, grasses) with either intermittent flooded or perennially saturated soils. Freshwater marshes are found throughout the coastal drainages of California wherever water slows down and accumulates, even on a temporary or seasonal basis.

**Compliance monitoring.** Monitoring that tracks the status of plan implementation, ensuring that planned actions are executed, including reserve design and creation, implementation of management activities, and implementation of monitoring activities (Atkinson et al. 2004).

**Conservation.** According to the federal Endangered Species Act, *conserve*, *conserving*, and *conservation* are the methods and procedures necessary to bring any endangered or threatened species to the point at which the measures provided under the Act are no longer necessary. Such methods and procedures include, but are not limited to, activities associated with resource management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation (16 U.S. Government Code 1532 [3]). According to the Natural Community Conservation Planning Act, *conserve*, *conserving*, and *conservation* are the use of methods and procedures within the Plan area that are necessary “to bring any covered species to the point

at which the measures provided pursuant to [the California Endangered Species Act] ... are not necessary, and for covered species that are not listed pursuant to [the California Endangered Species Act] ..., to maintain or enhance the condition of a species so that listing pursuant to [the California Endangered Species Act] ... will not become necessary.” In other words, the Natural Community Conservation Planning Act defines *conservation* as the steps necessary to remove a species from the California threatened or endangered species list (California Fish and Game Code 2085[d]).

**Conservation actions.** Specific activities that will be carried out to meet the conservation needs of the covered species and natural communities in order to achieve the biological goals and objectives.

**Conservation strategy.** The Plan’s overall and unified approach for achieving the biological goals and objectives. The conservation strategy is the collection of all conservation actions that will be implemented.

**Construction monitoring.** Monitoring by biologists of construction activities to ensure that conservation actions are implemented and impacts to biological resources are avoided or minimized in accordance with Plan requirements.

**Contribute to recovery.** Actions that measurably increase the baseline conditions necessary to support covered species and that contribute to the eventual delisting of a listed species or prevention of listing of a nonlisted species. A contribution to recovery does not include actions necessary to avoid, minimize, or mitigate impacts of covered activities.

**Cover (also canopy cover, areal cover).** The area of ground covered by vegetation of particular species or vegetation type, generally expressed as a percentage.

**Covered activities.** Those activities addressed in the Plan and for which the Permittees will seek a Natural Community Conservation Planning Act take permit pursuant to Section 2835 of the California Natural Community Conservation Planning Act, and an incidental take permit pursuant to Section 10 of the federal Endangered Species Act.

**Covered species.** Those species addressed in the Plan for which conservation actions will be implemented and for which the Permittees will seek authorization for take under Section 2835 of the California Natural Community Conservation Planning Act and Section 10 of the federal Endangered Species Act.

**Creation.** See *Habitat creation*.

**Critical habitat.** An area designated as critical habitat by the U.S. Fish and Wildlife Service or by the National Marine Fisheries Service pursuant to the federal Endangered Species Act. Critical habitat areas are specific geographic areas that may or may not be occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described and designated in the Federal Register (16 U.S. Government Code 1532 [5]).



**Cumulative impacts.** Result from the proposed actions' incremental impact when viewed together with past, present, and reasonably foreseeable future actions. Cumulative impacts are defined under both the ESA and NEPA. HCPs do not require a discussion of cumulative effects as analyzed under NEPA. However, as stated in the HCP handbook, "the applicant should help ensure that those considerations required of the Services by Section 7 have been addressed in the HCP" (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996:3–15). Accordingly, the Plan addresses the cumulative effects of public or private activities that could result from individually minor but collectively significant actions that take place over time. Cumulative effects of all projects with a federal nexus will be analyzed under NEPA and will not be addressed in the Plan in accordance with the ESA regulatory guidelines.

**Direct impacts.** Defined as activities or projects that remove or alter land cover types, or covered species habitat, populations, or occurrences (or portions of thereof). Direct impacts are caused by the project and occur at the time and place of project implementation (e.g., ground disturbance, inundation). Direct impacts can be either permanent or temporary (see definitions of permanent and temporary impacts immediately below).

**Dominance.** The extent to which a given species predominates a community by virtue of its size, abundance, or coverage.

**Effectiveness monitoring.** The measurement of variables that allow the program to assess the success of the Habitat Plan in meeting its stated biological objectives (Atkinson et al. 2004).

**Ecological integrity.** Ecosystems have *ecological integrity* when their native components are intact, including abiotic components, biodiversity, and ecosystem processes.

**Ecosystem.** A community of organisms and their physical environment interacting as an ecological unit.

**Ecosystem function.** The sum total of processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients.

**Ecosystem restoration.** The reestablishment of ecological functions within an area that historically supported those functions.

**Ecosystem services.** The benefits that people derive from ecosystems, including both commodities and regulating, supporting, and cultural services.

**Endangered species.** A native species, subspecies, variety of organism, or distinct population segment (DPS) which is in serious danger of becoming extinct throughout all or a significant portion of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease (16 U.S. Government Code 1532[6]; California Fish and Game Code Section 2062).

**Endemic.** A species, subspecies, or variety found only in the region defined.

**Enhance.** See *Habitat enhancement*.

**Environmental gradient.** A shift in physical and ecological parameters across a landscape, such as changes in topography, climate, land cover types, or natural communities.

**Ephemeral stream.** A stream that flows only in response to rain events and receives no groundwater input. As defined in the Habitat Plan, ephemeral streams will not include irrigation ditches, underground streams, or drainages and swales that have neither defined bed and bank nor evidence of scour or sediment transport. All other ephemeral drainages that qualify as streams will be considered under the Habitat Plan.

**Exception.** An allowance for reductions in mandated setback distances necessary to allow reasonable use and development of a property based on the variety of constraints and factors that may affect the property. Stream setback policies that apply to a large number of parcels with varying characteristics require a clear and practical set of setback exceptions. Exceptions will be used in a minority of cases where special circumstances apply that limit or restrict the ability of a landowner to fully apply the stream setback.

**Extinct species.** A species no longer in existence.

**Extirpated species.** A species no longer surviving in regions that were once part of its range.

**Geographic Information Systems (GIS).** Computer-based mapping technology that manipulates geographic data in digital layers and facilitates a wide array of environmental analyses.

**Greenline.** San José's urban growth boundary, beyond which urban development is prohibited (City of San José 2005).

**Habitat.** The environmental conditions that support occupancy of a given organism in a specified area (Hall et al. 1997). In scientific and lay publications, habitat is defined in many different ways and for many different purposes. For the purposes of the Plan, habitat is defined as the specific places where the environmental conditions (i.e., physical and biological conditions) are present that are required to support occupancy by individuals or populations of a given species. Habitat may be occupied (i.e., individuals or a population of the species are or have recently been present) or unoccupied. See also *Unoccupied habitat*.

**Habitat creation.** The manipulation of the physical, chemical, or biological characteristics present to develop a land cover type in an area that did not previously support it. Similar to restoration, creation results in establishment of new ecological function, value, and acreage of a natural community or land cover types.

**Habitat enhancement.** The manipulation of the physical, chemical, or biological characteristics of a land cover type to heighten, intensify, or improve one or more specific existing ecological function(s). Enhancement results in the gain of selected existing ecological function(s), but may also lead to a decline in other ecological function(s). Habitat enhancement implemented in the Reserve System will result in an increase or improvement in specific ecological function without a change in the amount of land cover types.

**Habitat quality.** The ability of the environment to provide conditions that support the persistence of individuals and populations (Hall et al. 1997). The precise meaning of habitat quality varies by species and depends on the subject species' specific needs in the context of a particular area. High-quality habitat for some species comprises only foraging and resting elements; for others it comprises foraging, resting, and nesting elements; for still others it may encompass all elements needed for the species to complete its lifecycle. Low-quality habitat would include only the minimal elements that support occurrence of the species. High-quality habitat tends to support larger numbers of species than low-quality habitat.

**Habitat restoration.** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a site that historically supported such functions, but no longer does because of the loss of one or more required ecological factors or as a result of past disturbance.

**Harass.** An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 Code of Federal Regulations 17.3). One component of the legal definition of "take" under the federal Endangered Species Act.

**Harm.** An act that kills or injures wildlife. Such an act may include significant habitat modification or degradation which results in injury of or death to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 Code of Federal Regulations 17.3). Harm is one component of the legal definition of "take" under the federal Endangered Species Act.

**Hydrology.** The movement of surface and subsurface water flows in a given area. The hydrology of an area is intimately connected with its precipitation, soils, and topography.

**Impacts.** Those actions affecting biological resources, specifically undeveloped land cover types and covered species, in the permit area. Impacts can be direct or indirect; they can also be cumulative.

**Implementing Entity.** The Implementing Entity is the agency or organization that will be responsible for fully implementing the Plan. The Implementing Entity will be identified later in the planning process.

**In-stream.** The stream bed and bank and the adjacent riparian corridor.

**Incidental take.** Any take otherwise prohibited, if such take is incidental to and not the purpose of the carrying out of an otherwise lawful activity (50 Code of Federal Regulations 17.3).

**Intermittent stream.** A stream that is supplied by both rainfall runoff and groundwater. Intermittent streams tend to be seasonal, with flow during the rainy season and into the late spring or early summer.

**Indicator species.** A species, the presence or absence of which is indicative of a particular habitat, community, or set of environmental conditions (Lincoln et al. 1998).

**Indirect impacts.** Defined by USFWS as “those that are caused by the proposed action and are later in time, but are still reasonably certain to occur” (50 CFR 402.02). Indirect impacts in the context of this Plan also include those impacts that occur at the time of the proposed action but beyond the footprint of a project or activity (i.e., beyond the area of land cover disturbance). While more difficult to detect and track, indirect impacts can undermine species viability or habitat quality, especially if multiple indirect or direct impacts work cumulatively to impair the species or to degrade the habitat.

**Interim project.** A project within the Plan study area that is proposed before adoption of the Plan and that has the potential to conflict with preliminary conservation objectives stated in the Planning Agreement.

**Invasive species.** A species that is non-native to the ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Atkinson et al. 2004; Executive Order 13112).

**In-kind/like-value creation.** Establishing a vegetative community or habitat that would provide the same ecological values over time as the vegetation community or habitat affected. For example, creating an artificial vernal pool that supports species similar to those found in an affected vernal pool would be in-kind/like-value creation.

**Intermittent stream.** A stream that is supplied by both rainfall runoff and groundwater. Intermittent streams tend to be seasonal, with flow during the rainy season and into the late spring or early summer.

**Keystone predator.** The dominant predator, often the top predator in a given food web; a predator having a major influence on community structure, often in excess of that expected from its relative abundance (Lincoln et al. 1998).

**Keystone species.** A species whose impacts on its community or ecosystem are large, and much larger than would be expected from its abundance (Groom et al. 2006).

**Land-cover type.** The dominant feature of the land surface discernible from aerial photographs and defined by vegetation, water, or human uses.

**Land-use designation.** The designation, by parcel, in an adopted city or county General Plan of the allowable uses.

**Local Partners.** The jurisdictions preparing the Plan and applying as Permittees: the County of Santa Clara, Cities of Gilroy, Morgan Hill, and San José; Santa Clara Valley Water District; and the Santa Clara Valley Transportation Authority. Also referred to as *Local Agencies* in the Planning Agreement.

**Metapopulation.** A group of partially isolated populations belonging to the same species that are connected by pathways of immigration and emigration. Exchange of individuals occurs between such populations, enabling recolonization of sites from which the species has recently become extirpated (Lincoln et al. 1998).

**Mitigation.** Actions or project design features that reduce environmental impacts by avoiding, minimizing, or compensating for adverse effects (Fulton 1999).

**Natural community.** A collection of species that co-occur in the same habitat or area and interact through trophic and spatial relationships. Communities are typically characterized by reference to one or more dominant species.

**Non-native species.** A species that is not native to the ecosystem under consideration.

**“No surprises assurances.”** Assurances to permit holders that if unforeseen circumstances arise, the U.S. Fish and Wildlife Service will not require more land, water, or money or additional restrictions on the use of land, water, or other natural resources beyond the level stated in the Habitat Plan without the consent of the Permittee (63 Federal Register 35, February 23, 1998). Applies as long as Permittee is implementing terms and conditions of the Habitat Plan properly. See also *Unforeseen circumstances*.

**Occurrence, plant.** A group of individuals of the same species or subspecies that are separated by at least 0.25 mile from other groups of individuals of the same species or subspecies.

**Open water.** Aquatic habitats such as lakes, reservoirs, water-treatment ponds, sloughs, and ponds (including percolation and stock ponds) that do not support emergent vegetation. Open water habitat in the study area is classified as pond or reservoir. Open water is used in the Plan to refer to land cover types collectively. Alternatively, ponds and reservoirs may be called out individually.

**Out-of-kind/like-value creation.** Establishing a similar, but not identical, vegetative community or habitat which over time, develops some of the same ecological functions and values as the affected vegetative community or habitat.

**Participating special entity.** A public agency such as a water, school, irrigation, transportation, or other special district that is not subject to the jurisdiction of the Permittees but requests and receives coverage under the Plan during implementation according to the terms of the Plan.

**Perennial stream.** A stream with year-round surface flow that is supplied by both rainfall runoff and groundwater, as well as by substantial dry-season inputs (e.g., runoff).

**Perennial wetlands.** These wetlands have permanent water sources during the dry season in an otherwise arid landscape and thus function as essential habitat for a wide variety of water-dependant wildlife.

**Performance indicator.** An environmental variable that is quantitatively measured over time to determine whether enhanced, created, or restored natural communities have successfully met Habitat Plan biological goals and objectives.

**Performance objective.** In monitoring, the optimal desired value for each performance indicator. Performance objectives establish a higher threshold for each indicator than that established for performance standards. Funding, design, and management objectives for enhanced, created, or restored natural communities are established at levels that are designed to ensure that the performance objectives are achieved. Failure to meet a performance objective would not constitute a changed circumstance or require remedial measures.

**Performance period.** In monitoring, the time over which performance standards must be met.

**Performance standard.** In monitoring, a minimum requirement necessary to achieve biological goals and objectives. Failure to achieve a performance standard could constitute a changed circumstance and require that remedial measures be implemented.

**Permanent impacts.** Direct impacts that permanently remove or alter a land cover, or that affect a land cover for more than one year during covered activity implementation and/or more than one year after completion of the covered activity (e.g., creating a new road through grassland). Permanent impacts also include indirect impacts to wetlands that result in a permanent (i.e., more than one year after completion of the covered activity) change to wetland functions (e.g., development around a wetland that reduces the surface water supply to a wetland that subsequently results in a reduction in the size of the wetland). Impacts that result in reduction of long-term viability of a plant occurrence are also considered permanent.

**Permittees.** The jurisdictions and agencies applying to the Wildlife Agencies for endangered species permits: the County of Santa Clara; Cities of Gilroy, Morgan Hill, and San José; Santa Clara Valley Water District; and the Santa Clara Valley Transportation Authority. See also *Local Partners*.

**Permit Term.** For the Habitat Plan, the length of time for which the incidental take permits are valid and during which Permittees (see also *Permittees*) may undertake activities covered by the permit. The permit term is also the time period in which all land acquisition, habitat restoration, and other mitigation and conservation actions must be accomplished. The permit term of the Habitat Plan is 50 years.

**Planning Agreement.** Document executed by the County of Santa Clara; Cities of Gilroy, Morgan Hill, and San José; Santa Clara Valley Water District; the Santa Clara Valley Transportation Authority; California Department of Fish and Game; and the U.S. Fish and Wildlife Service pursuant to the Natural Community Conservation Planning Act to guide the preparation of the Habitat Plan. It defines the parties' goals and obligations with regard to development of a legally sufficient and approvable Plan that will form the basis for take permits for covered activities and covered species.

**Planning surveys.** Surveys conducted by applicants for Habitat Plan coverage and used in the project-planning process to identify constraints and determine which Habitat Plan conservation actions are applicable. Planning surveys also include surveys conducted by the Implementing Entity on potential reserve lands to evaluate whether these lands will meet Plan requirements. See also *Implementing Entity*.

**Ponds.** Small (less than 20 acres) perennial or seasonal water bodies with little or no vegetation. If vegetation is present, it is typically submerged or floating. Ponds may occur naturally or may be created or expanded for livestock use (stock ponds). All ponds discernible on aerial photographs were mapped.

**Population.** A group of individuals of the same species inhabiting a given geographic area, among which mature individuals reproduce or are likely to reproduce. Ecological interactions and genetic exchange are more likely among individuals within a population than among individuals of separate populations of the same species.

**Practicable.** Referring to an action, available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose (45 Federal Register 85344, December 24, 1980: U.S. Environmental Protection Agency, Part 40 Code of Federal Regulations 230.3, Definitions).

**Preconstruction surveys.** Surveys conducted for certain biological resources immediately prior to construction, by applicants for Habitat Plan coverage, to ensure that species are adequately protected and that habitat avoidance and minimization measures can be effectively implemented during construction of covered projects or implementation of covered activities.

**Preservation.** Preventing changes in land use from a natural state by, for example, acquiring land or a conservation easement.

**Protect habitat.** To maintain existing or enhanced species habitat through acquisition of land or water bodies in fee title or with conservation easements, or other mechanisms for bringing unprotected sites under permanent protected status.

**Reach.** A section of a stream. Reaches are defined based on a specific need (e.g., monitoring) and do not necessarily reflect a standard set of characteristics.

**Range.** The geographic area a species is known or believed to occupy.

**Recovery.** The process by which the decline of an endangered or threatened species is arrested or reversed or threats to its survival neutralized so that its long-term survival in nature can be ensured. Recovery entails actions to achieve the conservation and survival of a species (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996), including actions to prevent any further erosion of a population's viability and genetic integrity, as well as actions to restore or establish environmental conditions that enable a species to persist (i.e., the long-term occurrence of a species through the full range of environmental variation).

**Recovery plan.** A document published by the U.S. Fish and Wildlife Service or by the National Marine Fisheries Service that lists the status of a listed species and the actions necessary to remove the species from the endangered species list.

**Recovery goal.** An established goal, usually quantitative, in a U.S. Fish and Wildlife Service or National Marine Fisheries Service recovery plan that identifies when a listed species is restored to a point at which the protections of the federal Endangered Species Act are no longer required.

**Reserves.** Discrete areas of conserved natural communities managed as single units under the Plan.

**Reserve System.** All Plan reserves considered collectively.

**Reservoirs.** Large open water bodies, greater than 20 acres that are highly managed for water storage, water supply, flood protection, or recreational uses.

**Restore.** See *Habitat Restoration*.

**Restoration.** See *Habitat Restoration*.

**Riparian habitat or vegetation.** Vegetation associated with river, stream, or lake banks and floodplains. Also defined by U.S. Fish and Wildlife Service (1997) as: Plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (i.e., rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: 1) distinctively different vegetation than adjacent areas, 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms due to the greater availability of surface and subsurface water.

**Ruderal.** A species or plant community that occurs on a highly disturbed site.

**Seasonal wetlands.** Freshwater wetlands that support ponded or saturated soil conditions during winter and spring and are dry through the summer and fall until the first substantial rainfall.

**Signature.** Characteristic value, color, or texture on an aerial photograph that correlates to a particular land-cover type.



**Special-status species.** Plants and animals that are legally protected under the federal and State Endangered Species Acts, or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing.

**Sphere of influence.** Line determined by the Local Area Formation Committee (LAFCO) indicating the probable ultimate physical boundaries and service area of a local government agency.

**Stream.** A watercourse that flows at least periodically or intermittently through a bed or channel having banks. This may include watercourses having a surface or subsurface flow that supports or has supported riparian vegetation, fish or other aquatic life. In the context of the Habitat Plan, a watercourse must meet SCVWD “*Criteria to Verify or Identify a Watercourse as a Stream*” (Santa Clara Valley Water Resources Protection Collaborative 2006) to qualify as a stream.

**Study area.** Geographic area studied by the Plan.

**Succession.** The change in the composition and structure of a biological community over time. Successional patterns often shift dramatically following a major disturbance (e.g., fire, flood, anthropogenic clearing of land).

**Suitable habitat.** Habitat that exhibits the characteristics necessary to support a given species.

**Take.** According to the federal Endangered Species Act (16 U.S. Government Code 1532 [19]), *take* means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. According to California Fish and Game Code (California Fish and Game Code Section 86), *take* means to hunt, pursue, catch, capture, or kill, or to attempt to hunt, pursue, catch, capture, or kill.

**Temporary impacts.** Direct impacts that alter land cover for less than one year and that allow the disturbed area to recover to pre-project or ecologically improved<sup>1</sup> conditions within one year (e.g., prescribed burning, construction staging areas) of completing construction. For the purposes of this Plan, all impacts associated with covered activities that have a duration exceeding one year or that take more than one year to restore immediately following construction will be considered permanent<sup>2</sup>.

**Threatened species.** A native species, subspecies, variety, or distinct population segment (DPS) of an organism that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future throughout all of a significant portion of its range (16 U.S. Government Code 1532 [5], California Fish and Game Code Section 2067).

<sup>1</sup> *Ecologically improved* means that the site functions ecologically better than the functions present on the site prior to ground disturbance.

<sup>2</sup> The Plan encourages on-site restoration by allowing project proponents to pay temporary impact fees when sites are restored to pre-project or ecologically improved conditions within 5 years of the end of the covered activity (see Chapter 9 for additional details).

**Unoccupied habitat.** Habitat that exhibits all the constituent elements necessary for a species, but which surveys have determined is not currently occupied by that species. The lack of individuals or populations in the habitat is assumed to be the result of reduced numbers or distribution of the species such that some habitat areas are unused. It is expected that these areas would be used if species numbers or distribution were greater. See also *suitable habitat*.

**Unforeseen circumstances.** Changes in circumstances affecting a covered species or geographic area covered by the Habitat Plan that could not reasonably have been anticipated by the plan developers, and that result in a substantial and adverse change in the status of a covered species. Under the state permit, this refers to changes affecting one or more species, habitat, natural community, or the geographic area covered by a conservation plan that could not reasonably have been anticipated at the time of plan development, and that result in a substantial adverse change in the status of one or more covered species.

**Urban growth boundary (UGB).** An officially adopted and mapped line dividing land to be developed from land to be protected for natural or rural uses, including agriculture. UGBs are regulatory tools, often designated for 20 or more years to provide greater certainty for both development and conservation goals.

**Urban limit line (ULL).** The line that separates current and future urban areas from rural areas. The urban line limit is a longer-term version of the urban growth boundary and is intended to reflect the City of Morgan Hill's long-term policy for growth, beyond the twenty-year timeframe of the urban growth boundary. The purpose of the urban limit line is to encourage more efficient growth patterns, minimize public costs, and protect environmental resources. Some, but not all, of the land outside the urban limit line has been identified as greenbelt. This line is defined as the limits of urban growth for Morgan Hill in the Habitat Plan.

**Urban service area.** The area within a city's sphere of influence where utilities such as gas, water, sewer, and electricity, and public services such as police, fire, schools, and parks and recreation are and will be provided.

**Watercourse.** A body of water that flows at least periodically or intermittently through a bed or channel having banks. This may include bodies of water having a surface or subsurface flow that supports or has supported riparian vegetation, fish or other aquatic life.

**Wetland(s).** Areas subject to seasonal or perennial flooding or ponding, or that possess saturated soil conditions and that support predominantly hydrophytic or "water-loving" herbaceous plant species. Within the plan area, wetland habitats are identified as coastal and valley freshwater marsh (i.e., perennial wetlands) or seasonal wetlands. The term wetland(s) is used to refer to all wetland types.

**Wildland-urban interface.** The area where structures and other human development meet or intermingle with undeveloped wildland (University of Wisconsin n.d.).

**Wildlife Agencies.** U.S. Fish and Wildlife Service and California Department of Fish and Game.

## Literature Cited

- Atkinson, A. J., P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore. 2004. *Designing Monitoring Programs in an Adaptive Management Context for Multiple Species Conservation Plans*. (U.S. Geological Survey Technical Report.) Sacramento, CA: U.S. Geological Survey Western Ecological Research Center.
- City of San José. 2005. *San José 2020 General Plan*. San José, CA.
- Fulton, W. B. 1999. *Guide to California planning*. Point Arena, California: Solano Press Books; 375 p.
- Groom, M.J., Meffe, G.K. and R.C. Carroll, and contributing authors. 2006. *Principles of Conservation Biology*, 3rd Edition. Sinauer Associates: Sunderland, MA. 793 pages.
- Hall, L.S., P.R. Krausman, and M.L. Morrison. 1997. The habitat concept and a plea for standard terminology. *Wildl. Soc. Bull.* 25:173-182.
- Leopold, L.B., Wolman, M.G., and Miller, J.P. 1964. *Fluvial Processes in Geomorphology*. W.H. Freeman, San Francisco, California
- Lincoln, R., G. Boxshall, P. Clark. 1998. *A Dictionary of Ecology, Evolution and Systematics*. Second Edition. Cambridge University Press, Cambridge, UK.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. *Habitat Conservation Planning Handbook, as Amended*. November. Amended June 2000. Washington, DC.
- U.S. Fish and Wildlife Service. 1997. *A system for mapping riparian areas in the western United States*. December. U.S. Fish and Wildlife Service National Wetlands Inventory, Department of Interior. Washington, DC. Available: <[http://www.fws.gov/wetlands/\\_documents/gOther/SystemMappingRiparianAreasWesternUS.pdf](http://www.fws.gov/wetlands/_documents/gOther/SystemMappingRiparianAreasWesternUS.pdf)>. Accessed: July 2010.
- University of Wisconsin n.d. The Wildland-Urban Interface. SILVIS Lab: Forest & Wildlife Ecology, University of Wisconsin – Madison. Available: <[http://silvis.forest.wisc.edu/projects/WUI\\_Main.asp](http://silvis.forest.wisc.edu/projects/WUI_Main.asp)>. Accessed: July 2010.

Appendix B

# Implementing Agreement



SANTA CLARA VALLEY HABITAT PLAN

IMPLEMENTING AGREEMENT

August 14, 2012

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- 3.23. **“Listed Species”** means a species (including a subspecies, or a distinct population segment of a species) that is listed as an endangered or threatened species under the ESA or as an endangered, threatened or candidate species under CESA. .... 15
- 3.24. **“Migratory Bird Treaty Act”** means the federal Migratory Bird Treaty Act (16 U.S.C. §703 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act. 15
- 3.25. **“NCCPA”** means the California Natural Community Conservation Planning Act (Fish & G. Code, §2800 et seq.), as amended on January 1, 2012, and all rules, regulations and guidelines promulgated pursuant to that Act. .... 15
- 3.26. **“NEPA”** means the National Environmental Policy Act (42 U.S.C. §4321 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act. .... 15
- 3.27. **“Neighboring Landowner”** means an owner of specific types of agricultural lands that are within one mile of lands included in the Reserve System who has received a special certificate (Exhibit C) from the Implementing Entity pursuant to Agreement Section 7.4.3 that extends Authorized Take coverage for certain Covered Species resulting from certain agricultural land uses. .... 15
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- 3.33. **“Permittees” means the Implementing Entity, County, Cities, Water District, and VTA. 15**
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- 3.39. **“SCVHP” and “Plan” mean the joint habitat conservation plan and natural community conservation plan prepared by the Permittees and approved by the Wildlife Agencies under Section 10 of the ESA and Section 2820 of the California Fish and Game Code. 16**
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# AGREEMENT

## 1. PARTIES

This Implementing Agreement (“**Agreement**”), made and entered into by and among the United States Fish and Wildlife Service (“**USFWS**”) of the United States Department of the Interior, the California Department of Fish and Game (“**CDFG**”) of the State of California Natural Resources Agency, the Santa Clara Valley Habitat Agency (the “**Implementing Entity**”), the County of Santa Clara (“**County**”), the City of San Jose (“**San Jose**”), the City of Gilroy (“**Gilroy**”), the City of Morgan Hill (“**Morgan Hill**”), the Santa Clara Valley Water District (“**Water District**”), and the Santa Clara Valley Transportation Authority (“**VTA**”) governs the implementation of the joint habitat conservation plan and natural community conservation plan for the Santa Clara Valley (the “**Santa Clara Valley Habitat Plan**,” the “**Plan**,” or the “**SCVHP**”) as of the Effective Date.

These entities may be referred to collectively as the “**Parties**” and individually as a “**Party**.” The USFWS and CDFG may be referred to collectively as the “**Wildlife Agencies**.” San Jose, Gilroy, and Morgan Hill may be referred to collectively as the “**Cities**” and each individually as a “**City**.” The Implementing Entity, County, Cities, Water District, and VTA may be referred to collectively as the “**Permittees**” and each individually as a “**Permittee**.”

## 2. RECITALS

The Parties have entered into this Agreement in consideration of the following:

**2.1.** In 2001, the preparation of a habitat conservation plan was included as an element of the project description used for a USFWS biological opinion for the Coyote Valley Research Park and four other projects. The habitat conservation plan was included to address the cumulative and indirect effects of urban growth, infrastructure development and operations and maintenance activities in Santa Clara County. In 2004, the County, San Jose, the Water District and the VTA entered into a Memorandum of Understanding that stated their shared intent to develop a joint habitat conservation plan and natural community conservation plan that would address certain existing and future environmental regulatory requirements for their various activities, including requirements pertaining to cumulative and indirect effects.

**2.2.** In 2005, the County, the Cities, the Water District, the VTA, USFWS and CDFG entered into a planning agreement pursuant to the California Natural Community Conservation Planning Act (the “**Planning Agreement**”). The Planning Agreement identified guidelines, criteria and procedures for the preparation of a joint habitat conservation plan and natural community conservation plan that would provide for the comprehensive management and conservation of numerous wildlife species. The SCVHP has been prepared according to the process described in the Planning Agreement.



**2.3.** The SCVHP is a plan to protect and enhance ecological diversity and function in a substantial portion of Santa Clara County, while allowing appropriate and compatible growth and development to occur in accordance with certain environmental laws. The Plan includes measures that provide for the conservation and management of certain “covered” species, and that avoid, minimize, and mitigate impacts on the “covered” species and their habitat resulting from various public and private activities, including urban growth and a variety of road, water, and other needed infrastructure construction and maintenance activities. The primary goal of the Plan is to fulfill the requirements of the federal Endangered Species Act and the California Natural Community Conservation Planning Act in order to obtain authorizations for the incidental take of certain covered species that may result from these activities.

**2.4.** The federal Endangered Species Act (“ESA”) prohibits the “take” of species listed as endangered or threatened under the ESA, as take is defined under federal law. Under Section 10 of ESA, USFWS may issue a permit authorizing the incidental take of endangered or threatened species during otherwise lawful activities if certain statutory requirements are met by the applicant and such take will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. To obtain a federal incidental take permit, the applicant must submit a habitat conservation plan describing, among other things, the steps the applicant will take to minimize and mitigate to the maximum extent practicable the impact of such “taking.” The Permittees submitted the SCVHP to USFWS and applied for a federal permit for incidental take of certain “covered” species within the area encompassed by the Plan. The incidental take permit issued by USFWS will be issued concurrently with its execution of this Agreement.

**2.5.** Like the ESA, the California Endangered Species Act (“CESA”) prohibits the take of species listed as endangered, threatened or candidate species under CESA. The Natural Community Conservation Planning Act (“NCCPA”) allows CDFG to authorize by permit the take of any species other than mountain lions (California Fish and Game Code section 4800 et seq.), including species listed as an endangered, threatened or candidate species under CESA, where the conservation and management of the species is provided for in a natural community conservation plan approved by CDFG. Because the SCVHP was developed to meet the standards of the NCCPA, it will do more than minimize and mitigate the impacts of the activities covered in the Plan, as the ESA requires. The Plan will also contribute to the recovery of listed species and help prevent other species from becoming threatened or endangered. The Permittees submitted the SCVHP to CDFG for approval and permitting for take pursuant to NCCPA. CDFG will issue a permit based on the SCVHP concurrently with its execution of this Agreement.

**2.6.** All of the Permittees intend to receive coverage under the federal incidental take permit, and the state permit issued pursuant to the NCCPA, for certain “covered” activities that they will implement, including infrastructure projects and operations and maintenance activities. In addition, the County and the Cities intend to allow developers, infrastructure project proponents and certain landowners to receive coverage under the permits for certain development and other activities, subject to the conditions in the Permits. The Implementing Entity may also negotiate agreements with other public entities to allow certain activities of such entities to be covered by the permits, subject to the conditions in the Permits.

2.7. The Permittees are agreeing to substantial commitments of land, natural resources, financial resources, human resources and other assets to conserve and manage the "covered" species, their habitats and other natural communities, in exchange for the assurances provided by the Wildlife Agencies in this Agreement.

### 3. DEFINITIONS

The following terms as used in this Agreement will have the meanings set forth below. Terms specifically defined in applicable federal or state statutes, including but not limited to, the ESA, CESA or NCCPA or the regulations adopted by USFWS and CDFG under those statutes will have the same meaning when used in this Agreement. Definitions used in this Agreement may elaborate on, but are not intended to conflict with, such statutory or regulatory definitions.

- 3.1. **"Agreement"** means this Implementing Agreement.
- 3.2. **"Annual Report"** means the Annual Report prepared by the Implementing Entity about implementation of the SCVHP, as provided in Agreement Section 14 and further described in SCVHP Chapter 8.11.
- 3.3. **"Authorized Take"** means the extent of incidental Take of Covered Species authorized by USFWS in the Federal Permit issued to the Permittees pursuant to Section 10(a)(1)(B) of the ESA, and the extent of Take of Covered Species authorized by CDFG in the State Permit issued to the Permittees pursuant to California Fish and Game Code section 2835.
- 3.4. **"CDFG"** means the California Department of Fish and Game, a department of the California Resources Agency.
- 3.5. **"CEQA"** means the California Environmental Quality Act (Pub. Resources Code §21000 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.6. **"CESA"** means the California Endangered Species Act (Fish & G. Code, §2050 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.7. **"Changed Circumstances"** as defined at 50 C.F.R. §17.3 means changes in circumstances affecting a Covered Species or the geographic area covered by the SCVHP that can reasonably be anticipated by the Parties and that can reasonably be planned for in the SCVHP. Changed Circumstances and planned responses to Changed Circumstances are more particularly defined in Agreement Section 11.3 and SCVHP Chapter 10.2.1. Changed Circumstances do not include Unforeseen Circumstances.
- 3.8. **"Chapter"** means a chapter, subchapter, or section of the SCVHP.
- 3.9. **"Conditions"** or **"Conditions on Covered Activities"** means the avoidance and minimization measures described in SCVHP Chapter 6, and the requirement to pay certain fees, or to provide land or implement conservation actions in lieu of such fees, described in SCVHP Chapter 9, which will be incorporated in Covered Activities, as provided in Agreement Section 8.

- 3.10. **“Conserve,” “Conserving,” or “Conservation”** means to use, and the use of, methods and procedures within the SCVHP Permit Area that are necessary to bring the federally and state-listed Covered Species to the point at which the measures provided pursuant to the ESA and CESA are not necessary, and to maintain or enhance the condition of the non-listed Covered Species so that listing pursuant to the ESA and CESA will not become necessary.
- 3.11. **“Conservation Measure”** means each action detailed in SCVHP Chapter 5 that is a component of the Conservation Strategy.
- 3.12. **“Conservation Strategy” or “SCVHP Conservation Strategy”** means the conservation strategy described in SCVHP Chapter 5.
- 3.13. **“Covered Activities”** means the otherwise lawful activities and projects described in SCVHP Chapter 2.3 that the Permittees or Third Party Participants may implement in the Permit Area for which incidental Take is authorized by the Wildlife Agencies pursuant to the Permits.
- 3.14. **“Covered Species”** means the species, listed and non-listed, whose conservation and management are provided for in the SCVHP and for which incidental Take is authorized by the Wildlife Agencies pursuant to the Permits. Covered Species are listed in **Exhibit A** to this Agreement.
- 3.15. **“Effective Date”** means the date of the first business day after all of the following have occurred: execution of this Agreement by all Parties; issuance of both of the Permits; adoption of an SCVHP implementing ordinance by each of the Cities and the County, as provided in Agreement Section 17.1, and formation of the Implementing Entity described in 3.21 of the Agreement.
- 3.16. **“Evaluation Checklist”** means the checklist prepared by the Implementing Entity to guide the County and the Cities’ review of habitat plan application packages submitted by private project proponents.
- 3.17. **“Federal Listed Species”** means the Covered Species that are listed as threatened or endangered species under the ESA as of the Effective Date, and the Covered Species that are listed as threatened or endangered pursuant to the ESA during the term of the SCVHP as of the date of such listing.
- 3.18. **“Federal Permit”** means the federal incidental take permit issued by USFWS to the Permittees based on the SCVHP pursuant to Section 10(a)(1)(B) of the ESA.
- 3.19. **“ESA”** means the Federal Endangered Species Act of 1973, as amended (16 U.S.C § 1531 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.20. **“Fully Protected Species”** means any species identified in California Fish and Game Code sections 3511, 4700, 4800, 5050 or 5515.

- 3.21. **“Implementing Entity”** means the Santa Clara Valley Habitat Agency, a joint exercise of powers agency composed of the County and the Cities, formed pursuant to the Joint Powers Act, Gov. Code § 6500 et seq.
- 3.22. **“Independent Conservation Assessment Team”** means the Independent Conservation Assessment Team as provided in Agreement Section 11.2.3 and further described in SCVHP Chapter 7.2.3.
- 3.23. **“Listed Species”** means a species (including a subspecies, or a distinct population segment of a species) that is listed as an endangered or threatened species under the ESA or as an endangered, threatened or candidate species under CESA.
- 3.24. **“Migratory Bird Treaty Act”** means the federal Migratory Bird Treaty Act (16 U.S.C. §703 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.25. **“NCCPA”** means the California Natural Community Conservation Planning Act (Fish & G. Code, §2800 et seq.), as amended on January 1, 2012, and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.26. **“NEPA”** means the National Environmental Policy Act (42 U.S.C. §4321 et seq.) and all rules, regulations and guidelines promulgated pursuant to that Act.
- 3.27. **“Neighboring Landowner”** means an owner of specific types of agricultural lands that are within one mile of lands included in the Reserve System who has received a special certificate (Exhibit C) from the Implementing Entity pursuant to Agreement Section 7.4.3 that extends Authorized Take coverage for certain Covered Species resulting from certain agricultural land uses.
- 3.28. **“Non-listed Species”** means a species (including a subspecies, or a distinct population segment of a species) that is not listed as endangered or threatened under the ESA or as an endangered, threatened, or candidate species under CESA.
- 3.29. **“Participating Special Entity”** means an entity that is not subject to the City’s or the County’s land use or other regulatory authority that has entered into a special agreement with the Implementing Entity pursuant to Agreement Section 7.4.2 to receive Authorized Take coverage for a project or activity within the Permit Area.
- 3.30. **“Party”** and **“Parties”** mean the signatories to this Agreement, individually and collectively.
- 3.31. **“Permit Area”** means the area within which the Permittees are seeking authorization from the Wildlife Agencies for the Take of Covered Species resulting from Covered Activities. The Permit Area is further described in SCVHP Chapter 1.2.2 and is depicted in Figure 1-2 of the SCVHP.
- 3.32. **“Permits”** means the Federal Permit and the State Permit, which incorporate the SCVHP and the Agreement by reference.
- 3.33. **“Permittees”** means the Implementing Entity, County, Cities, Water District, and VTA.

- 3.34. **“Planning Agreement”** means the document executed in 2005, by the County, the Cities, the Water District, the VTA, USFWS and CDFG pursuant to the NCCPA to guide the preparation of the SCVHP.
- 3.35. **“Planning Limit of Urban Growth”** means the geographical extent of Authorized Take coverage for urban development as described in SCVHP Chapter 2.2.3 and further explained in SCVHP Chapter 2.2.1, and as delineated in Figure 2-2 of the SCVHP.
- 3.36. **“Private Project Participant”** means a private person or entity that has received Take Authorization coverage from a City or the County pursuant to Agreement Section 7.4.1 for a project or activity within the Permit Area that is subject to the land use or other regulatory authority of the City or the County.
- 3.37. **“Reserve Unit Management Plan”** means a Reserve Unit Management Plan as provided in Agreement Section 10.1 and as further described in SCVHP Chapter 5.2.5.
- 3.38. **“Reserve System”** means the land acquired and dedicated in perpetuity through either a fee interest or conservation easement intended to meet the preservation, conservation, enhancement and restoration objectives of the Conservation Strategy of the SCVHP. The Reserve System may also include up to one thousand (1,000) acres of land owned by the Santa Clara Valley Open Space Authority as of the Effective Date, on which the recordation of a conservation easement is precluded by law, without recordation of a conservation easement, provided the lands otherwise meet the requirements for Reserve System lands as further described in SCVHP Chapter 5.2.3 and SCVHP Chapter 9.4.2.
- 3.39. **“SCVHP”** and **“Plan”** mean the joint habitat conservation plan and natural community conservation plan prepared by the Permittees and approved by the Wildlife Agencies under Section 10 of the ESA and Section 2820 of the California Fish and Game Code.
- 3.40. **“SCVHP Fees”** means the Land Cover Fee, the Serpentine Fee, the Nitrogen Deposition Fee, the Endowment Fee Component, the Plan Preparation Cost Recovery Fee Component, the Wetland Fee, the Temporary Impact Fee, and the Burrowing Owl Fee, as further described in SCVHP Chapter 9.4.1.
- 3.41. **“Section”** means a section or subsection of this Agreement.
- 3.42. **“State Listed Species”** means the Covered Species that are listed as threatened or endangered species, or a candidate for such status, under CESA, as of the Effective Date, and the Covered Species that are listed as threatened or endangered, or a candidate for such status pursuant to CESA during the term of the SCVHP, as of the date of such listing.
- 3.43. **“State Permit”** means the state Take permit issued to the Permittees based on the SCVHP pursuant to Section 2835 of the California Fish and Game Code.
- 3.44. **“Take”** and **“Taking”** have the same meaning provided by the ESA and its implementing regulations with regard to activities subject to the ESA, and also have the same meaning

provided in section 86 of the California Fish and Game Code with regard to activities subject to CESA and NCCPA.

- 3.45. **"Third Party Participants"** means Private Project Participants, Participating Special Entities, Neighboring Landowners and other persons or entities that that are not Permittees and that receive Authorized Take coverage from a Permittee in accordance with Agreement Section 7.4.
- 3.46. **"Three Creeks Habitat Conservation Plan"** and **"3CHCP"** mean the habitat conservation plan being developed by the Santa Clara Valley Water District to protect and enhance habitats for aquatic species and provide conservation for species affected by the District's on-going water supply operations in the northern Santa Clara Valley.
- 3.47. **"Unforeseen Circumstances"** under the Federal Permit, as defined at 50 C.F.R. §17.3, means changes in circumstances affecting a Covered Species or geographic area covered by the SCVHP that could not reasonably have been anticipated by the Permittees and USFWS at the time of the SCVHP's negotiation and development, and that result in a substantial and adverse change in the status of a Covered Species. **"Unforeseen Circumstances"** under the State Permit means changes affecting one or more species, habitat, natural community, or the geographic area covered by a conservation plan that could not reasonably have been anticipated at the time of plan development, and that result in a substantial adverse change in the status of one or more Covered Species.
- 3.48. **"USFWS"** means the United States Fish and Wildlife Service, an agency of the United States Department of Interior.
- 3.49. **"Wetlands"** means the wetlands types described in SCVHP Chapter 3.3.5, including coastal and valley freshwater marsh and seasonal wetlands.
- 3.50. **"Wildlife Agencies"** means USFWS and CDFG.

#### 4. PURPOSES OF THIS AGREEMENT

This Agreement defines the Parties' roles and responsibilities and provides a common understanding of actions that will be undertaken to avoid, minimize and mitigate the effects on the Covered Species caused by the Covered Activities within the Permit Area, and to provide for the conservation of the Covered Species within the Permit Area. The purposes of this Agreement are:

- To ensure implementation of each of the terms and conditions of the Permits;
- To note the existence of long term assurances to the Permittees that, pursuant to the federal "No Surprises" provisions of 50 Code of Federal Regulations, sections 17.22(b)(5) and 17.32(b)(5), and California Fish and Game Code section 2820, subdivision (f), as long as the terms and conditions of this Agreement, the SCVHP, and the Permits are fully satisfied, the Wildlife Agencies will not require of the Permittees the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources, either to minimize and mitigate the impacts of Authorized Take, or to

provide for the conservation and management of the Covered Species in the Permit Area, except as provided in this Agreement and the SCVHP; and

- To describe remedies and recourse should any Party fail to perform its obligations as set forth in this Agreement.

## **5. INCORPORATION**

### **5.1 Incorporation of the Plan**

The SCVHP and each of its provisions are intended to be, and by this reference are, incorporated herein. This Agreement is intended to specify the obligations of the Parties under the SCVHP, recognizing that the SCVHP is a conservation plan and was not drafted as a contract. In the event of any direct contradiction, conflict or inconsistency between this Agreement and the SCVHP, the terms of this Agreement will control. In all other cases, the provisions of this Agreement and the SCVHP will be interpreted to be consistent with and complementary to each other.

### **5.2 Incorporation into the Permits**

This Agreement and the SCVHP shall be incorporated as terms and conditions of the Permits. In the event of any direct contradiction among the provisions of the SCVHP, the terms of this Agreement or the terms of the Permits, the terms of the Permits shall control. Each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by the other Party or anyone acting on behalf of the other Party that is not embodied in the SCVHP, this Agreement, or the Permits.

## **6. IMPLEMENTATION ROLES AND RESPONSIBILITIES**

The general roles and responsibilities of the Parties for the implementation of the SCVHP are as follows.

### **6.1. Permittees' Responsibilities**

The Permittees will fully and faithfully perform all obligations assigned to them collectively, and to each of them individually, under this Agreement, the SCVHP, and the Permits.

### **6.2. USFWS Responsibilities**

USFWS will provide timely technical assistance and review, collaboration and consultation to the Permittees regarding implementation of the SCVHP, as provided in this Agreement and the SCVHP, throughout the duration of the Federal Permit. USFWS will also use all reasonable efforts to assist the Permittees to achieve the SCVHP conservation and recovery goals for the Covered Species, as described in SCVHP Chapters 8.7.3 and 9.4.3.

### **6.3. CDFG Responsibilities**

CDFG will provide timely technical assistance and review, collaboration and consultation to the Permittees regarding implementation of the SCVHP, as provided in this Agreement and the SCVHP,

throughout the duration of the State Permit. CDFG will also use all reasonable efforts to assist the Permittees to achieve the SCVHP conservation and recovery goals for the Covered Species, as described in SCVHP Chapters 8.7.3 and 9.4.3.

#### **6.4. Role of Implementing Entity**

The Permittees collectively are ultimately responsible for compliance with all applicable terms and conditions of the Permits. The Implementing Entity will have primary responsibility for implementing the SCVHP on behalf of the other Permittees. The Implementing Entity may delegate the implementation of specific actions to other Parties or qualified third parties, including but not limited to public agencies, private conservation organizations, university scientists, and contractors, but the Implementing Entity itself will remain responsible for ensuring overall implementation of the SCVHP on behalf of the other Permittees in accordance with the Permits. As further described in SCVHP Chapter 8.3, the Implementing Entity's responsibilities generally include, but are not necessarily limited to, implementation and management of all of the following elements of the SCVHP:

- administration of the SCVHP, including staffing, and providing necessary scientific, legal, and financial expertise and consulting services;
- oversight of compliance with the Permits;
- creation of the Reserve System;
- management of Reserve System Lands;
- monitoring, adaptive management and changed circumstances;
- funding; and
- information management.

##### **6.4.1. SCVHP Implementation Key Deadlines for Compliance**

The Parties' agreement about how key elements of the SCVHP will be implemented over time are summarized in the implementation compliance deadlines set forth in Table 8-2 of the SCVHP and further explained in SCVHP Chapter 8.12. The Parties recognize that, under certain circumstances, it might be reasonable and appropriate to modify one or more of the deadlines by modifying or amending the SCVHP, this Agreement, or the Permits, as provided in Agreement Section 15. However, absent such a modification or amendment, the Implementing Entity, on behalf of the Permittees, will meet the implementation deadlines set forth in SCVHP Table 8-2 .

#### **6.5. Collaboration among the Parties**

The Parties agree that successful collaboration among them is important to the success of the SCVHP. Notwithstanding any other Section of this Agreement or Chapter of the SCVHP, each Party will make a reasonable effort to: meet and confer with any other Party upon the request of that Party to address matters pertaining to the SCVHP, the Permits, or this Agreement; provide relevant, non-proprietary, non-confidential information pertaining to the SCVHP upon the request of any Party; and provide timely responses to requests from any Party for advice, concurrence, or review and comment on reports, surveys or other documents, regarding matters pertaining to the SCVHP, the Permits, or this Agreement.



## **6.6. Dispute Resolution**

The Parties recognize that disputes concerning implementation or interpretation of this Agreement, the SCVHP, and the Permits may arise from time to time. The Parties intend to resolve most disputes at the staff or field personnel level. However, the Parties recognize that some disputes might not be resolved at the staff or field personnel level. The Parties agree to work together in good faith to resolve such disputes using the informal dispute resolution procedure set forth in this Section. Any Party may seek any available remedy without regard to this Section if the Party concludes that circumstances so warrant. However, unless the Parties agree upon another dispute resolution process, or unless a Party has initiated administrative proceedings or litigation related to the subject of the dispute in federal or state court, the Parties agree to use the following procedures to attempt to resolve disputes.

### **6.6.1. Notice of Dispute; Meet and Confer**

If a Wildlife Agency objects to any action or inaction by any Permittee on the basis that the action or inaction is inconsistent with the SCVHP, the Permits, or this Agreement, it will so notify the Permittee and the Implementing Entity and when appropriate, other Wildlife Agencies, in writing, explaining the basis of such objection. The Permittee or Implementing Entity will respond to the notice within thirty (30) days of receiving it, stating what actions the Permittee or Implementing Entity proposes to take to resolve the objection or, alternatively, explaining why the objection is unfounded. If the response resolves the objection to the satisfaction of the Wildlife Agency, the agency will so notify the Permittee and the Implementing Entity, and the Permittee or Implementing Entity, as appropriate, will implement the actions, if any, proposed in the response to the agency. If the response does not resolve the objection to the Wildlife Agency's satisfaction, the agency will notify the Permittee or Implementing Entity accordingly, and the agency, the Permittee and the Implementing Entity will meet and confer to attempt to resolve the dispute. The meeting will occur within thirty (30) days after the Permittee or Implementing Entity receives the Wildlife Agency's response, or at such later time as the Permittee, the Implementing Entity and the Wildlife Agency may agree. A representative of the Implementing Entity will take notes at the meeting, summarize the outcome, and distribute meeting notes to each Party in attendance.

The Implementing Entity or any other Permittee will use the same procedure to raise and to resolve objections to any action or inaction of a Wildlife Agency, and the Wildlife Agency will respond in the same manner to notices delivered by any Permittee.

### **6.6.2. Elevation of Dispute**

If the Parties do not resolve a dispute after completing the dispute resolution procedure in Agreement Section 6.6.1, any one of the Parties may elevate the dispute to a meeting of the chief executives of the involved Parties. For purposes of this provision, "chief executive" means the city manager of a city, the county executive of the County, the chief executive officer of the Water District, the general manager of the VTA, the executive director of the Implementing Entity, the CDFG Regional Manager, and the USFWS Field Supervisor. Each Party will be represented by its chief executive in person or by telephone at the meeting, and the meeting will occur within forty-five (45) days of a request by any Party following completion of the dispute resolution procedure.

## **7. TAKE AUTHORIZATION**

As of the Effective Date, the Permittees may Take the Covered Species, provided the Take is incidental to the implementation of Covered Activities in the Permit Area, as further authorized by and subject to the conditions of this Agreement, the SCVHP, and the Permits. The Covered Activities include all activities identified as such in SCVHP Chapter 2.3. The Permits do not authorize Take resulting from projects or activities that are not identified as Covered Activities in SCVHP Chapter 2.3.

The Permittees' Take authority covers all of their respective elected officials, officers, directors, employees, agents, subsidiaries, and contractors who engage in any Covered Activity. Each Permittee will be responsible for supervising compliance with the relevant terms and conditions of the Permits by its own elected officials, officers, etc., and all contracts between a Permittee and any such person or entity regarding the implementation of a Covered Activity will require compliance with the Permits. The Implementing Entity will periodically provide an educational program to fully inform all such persons and entities of the relevant terms and conditions of the Permits. In this context, 'periodically' means at least once every five years or sooner if at least 50% of the targeted positions have new personnel.

### **7.1. Issuance of the Permits**

Concurrent with its execution of this Agreement, and after satisfaction of all other applicable legal requirements, USFWS will issue the Permittees a permit under Section 10(a)(1)(B) of the ESA (the "**Federal Permit**"). The Federal Permit will authorize incidental take of all Federal Listed Covered Species resulting from Covered Activities in the Permit Area. Subject to compliance with all other terms of this Agreement, the Federal Permit will take effect for all Non-listed Covered Species upon the listing of such species under the ESA.

Concurrent with its execution of this Agreement, and after satisfaction of all other applicable legal requirements, CDFG will issue the State Permit.

### **7.2. Ongoing Role of Wildlife Agencies**

As of the Effective Date, the Permittees may implement Covered Activities and extend Authorized Take coverage to Third Party Participants in accordance with the Permits without the prior approval of the Wildlife Agencies, except as provided in Agreement Section 7.2.1. As further described in SCVHP Chapter 8.7.3, the Wildlife Agencies' will monitor implementation of the SCVHP to ensure overall compliance with the Permits. To ensure that the Wildlife Agencies are adequately informed about the Permittees' use and extension of Authorized Take coverage, the Permittees will provide copies of any application and supporting information required in SCVHP Chapter 6.8 for any Covered Activity upon the request of any Wildlife Agency.

As further described in SCVHP Chapter 8.7.3, the Wildlife Agencies' approval is required for certain components of the conservation strategy and specific projects. The Wildlife Agencies will be third-party beneficiaries on conservation easements recorded on Reserve System lands, as further described in SCVHP Chapter 8.6.3. The Wildlife Agencies will also participate in implementation of the SCVHP adaptive management program, as further described in SCVHP Chapter 7.

### **7.3. Authorized Take for Projects and Activities Implemented by Permittees**

Each Permittee will ensure that all Covered Activities it implements comply with the Permits. As further described in SCVHP Chapter 8.7.1, as of the Effective Date, each Permittee will document such compliance and provide a copy of that documentation to the Implementing Entity, which will maintain a record of compliance documentation for all Covered Activities implemented by Permittees.

Within one (1) month after the Effective Date, the Permittees will develop a template to standardize the form in which they document their compliance with the Permits. The template will be substantively similar to the “Habitat Plan Application Package” for Private Project Participants, as described in Agreement Section 7.4 and SCVHP Chapter 6.7 and SCVHP Chapter 6.8. However, the Permittees may adapt the form of the Habitat Plan application package for their use as they deem appropriate. Until the template is developed for Covered Activities implemented by the Permittees, the Permittees will use the Habitat Plan Application Package used for Private Project Participants.

When one or more SCVHP Fees are required for a Covered Activity implemented by a Permittee, the Implementing Entity will calculate the required fee amount, and the Permittee will transfer that amount to the Implementing Entity before initiating the Covered Activity. As further described in SCVHP Chapter 9.4.1, Permittees may use any applicable alternative to fee payment allowed in the SCVHP, including, but not limited to, providing suitable land in lieu of some or all fees. Permittees with the ability to implement actions described in SCVHP Chapter 5, pertaining to the SCVHP Conservation Strategy, or SCVHP Chapter 7, pertaining to the SCVHP monitoring and adaptive management program, that contribute to the successful implementation of the SCVHP Conservation Strategy, may obtain a credit against all or a portion of a required fee amount in exchange for implementation of those actions. The Implementing Entity will prepare a written determination of whether any such credit proposed by a Permittee conforms to the SCVHP and is approved. The written determination will include the amount of any approved credit, as described in SCVHP Chapter 9.4.1.

Take Authorization coverage for any Covered Activity implemented by a Permittee will take effect upon the Permittee’s delivery to the Implementing Entity of its documentation of compliance with this Agreement, the SCVHP, and the Permits, and any required fee amount or any fee alternative approved by the Implementing Entity.

### **7.4. Extension of Take Authorization to Third Party Participants**

As further provided by the Permits, Authorized Take coverage may be extended to “**Third Party Participants**,” which include “**Private Project Participants**,” “**Participating Special Entities**” and “**Neighboring Landowners**.” The Implementing Entity may extend Authorized Take coverage to Participating Special Entities and Neighboring Landowners and will be responsible for determining whether applications or requests from potential Participating Special Entities and Neighboring Landowners comply with all applicable terms and conditions of the Permits. The County and Cities may extend Authorized Take coverage to Private Project Participants and will be responsible for determining whether applications from potential Private Project Participants comply with all such

terms and conditions and will make findings supporting such determination before extending Authorized Take coverage.

#### **7.4.1. Private Project Participants**

The County and the Cities will each require proponents of private projects that are subject to their land use or other regulatory authority and fall within the categories of projects and activities described in SCVHP Chapter 2.3 to comply with all applicable terms and conditions of the Permits, and will extend Authorized Take coverage to such projects, as provided in this Section.

##### **7.4.1.1. SCVHP Application Process**

As further described in SCVHP Chapter 6.7.2, the County and the Cities will require proponents of private projects that are subject to their land use or other regulatory authority and fall within the categories of projects and activities described in SCVHP Chapter 2.3 to submit an application package as described in SCVHP Chapter 6.8 and will review the application package based on an "Evaluation Checklist" that will be prepared by the Implementing Entity. The County's and Cities' review of the application package will occur concurrently with the environmental review of the project pursuant to CEQA, for projects subject to CEQA.

Based on its review of each application package, the applicable City or the County will prepare a written determination regarding whether the private project, as proposed in the application package, includes all applicable terms and conditions of the Permits and that take associated with the implementation of the proposed project is properly authorized through the Permits. If the City or County concludes that the project as proposed does not include all applicable terms and conditions, it will explain the deficiency or omission in writing to the private project proponent and will reject the application. If the City or County concludes that the project as proposed includes all applicable terms and conditions, it will prepare a written determination to that effect (a "Compliance Determination").

The Cities and the County will provide each Compliance Determination to the Implementing Entity and maintain a copy of all SCVHP application packages for which they have prepared a Compliance Determination, which shall be made available to the Implementing Entity as part of annual and other reviews.

Nothing in this Section shall be construed to affect the ability of the County or a City to determine that an application for a private project is incomplete or to deny a private project application for any reason unrelated to the SCVHP or the Permits.

##### **7.4.1.2. Extension of Authorized Take Coverage to Private Project Participants**

If a City or the County prepares a Compliance Determination for a private project following completion of the SCVHP application process, the private project proponent will be eligible for Authorized Take coverage as a Private Project Participant. The City or County will require the private project proponent to comply with all applicable terms and conditions of the Permits. The City or County may enter into an agreement in which the project's proponent assumes the obligation to comply with such terms and conditions or may require such compliance as a condition of project approval. Once the agreement is entered into or the conditions of approval are imposed,

all applicable SCVHP Fees have been paid to the Implementing Entity as provided in Agreement Section 8.2 and further described in SCVHP Chapter 9.4.1, and any lands in lieu of fees have been provided as provided in Agreement Section 8.2 and further described in SCVHP Chapter 8.6.7, and the City or County has otherwise finally approved the project, the applicable City or the County will extend Authorized Take coverage to the project proponent. The project proponent thereafter will have Authorized Take coverage as a Private Project Participant.

Once Authorized Take coverage has been extended to a Private Project Participant, it will remain in effect with regard to the project for as long as the Private Project Participant fully complies with all applicable terms and conditions of the Permits, unless:

- the Wildlife Agencies have suspended or revoked the Permits;
- Take has not yet occurred; and
- the Wildlife Agencies determine that Take caused by the project would result in jeopardy.

If the Private Project Participant does not comply with such terms and conditions, or if the applicable City or County suspends or revokes its approval of the project, the City or County will also suspend or revoke the Authorized Take coverage for the project.

The County and the Cities will not require Private Project Participants to provide any additional mitigation to address impacts to Covered Species beyond what is required in the Permits for purposes of extending Authorized Take; provided, however, that the County and Cities may impose additional requirements for purposes of other state or federal environmental permits, e.g., permits under the Federal Clean Water Act.

#### **7.4.1.3. SCVHP Implementing Ordinances**

Before the Effective Date, the Cities and the County will each consider the adoption of an SCVHP implementing ordinance substantively similar to the model ordinance attached to this Agreement as **Exhibit B** that sets forth the application process for potential Private Project Participants. The implementing ordinance will, among other things: provide for the imposition of SCVHP Fees, as provided in Agreement Section 8.2 and further described in SCVHP Chapter 9.4.1; establish the jurisdiction's procedure for extending Authorized Take coverage to Private Project Participants, as provided in this Agreement Section 7.4.1; and provide for the conveyance of land in lieu of SCVHP Fees, in accordance with Agreement Section 8.3 and SCVHP Chapter 8.6.7. The Cities and the County may extend Authorized Take coverage to Private Project Participants only after adopting an SCVHP implementing ordinance in accordance with this Section. In addition, the Permittees recognize that the Wildlife Agencies' findings regarding the adequacy of funding for SCVHP implementation will be based, in part, on the expectation that the Cities and the County will adopt implementing ordinances that require the payment of SCVHP Fees and that failure by a City or the County to adopt an implementing ordinance will prevent the Permits from taking effect.

The model ordinance in **Exhibit B** is intended to exemplify the necessary substantive terms of an SCVHP implementing ordinance; it is not intended to dictate the precise terms of each such ordinance. The County and each City may each adapt the model ordinance to reflect its independent findings, to maximize administrative efficiency, or for other reasons, provided the

substance of the operative terms in the model ordinance is reflected in each implementing ordinance.

#### **7.4.2. Participating Special Entities**

As further described in SCVHP Chapter 8.4, the Implementing Entity may extend Authorized Take coverage to public entities that are not Permittees, including, but not limited to, school, water, irrigation, transportation, park and other districts and utilities, pursuant to a contractual agreement that defines all planning, implementation, management, enforcement and funding responsibilities necessary for the entity to comply with the Permits. Such public entities thereafter will have Authorized Take coverage as Participating Special Entities.

The Implementing Entity may, with Wildlife Agency approval, enter into an agreement with a Participating Special Entity if the Participating Special Entity explains how it will comply with all applicable terms and conditions of the Permits in an application satisfying the criteria detailed in SCVHP Chapter 6.8. Among other things, the agreement must adequately address the legal and equitable remedies available to the Implementing Entity if the Participating Special Entity fails to perform its contractual obligations. As provided in SCVHP Chapter 8.4, after execution of such an agreement and the payment of all fees specified by the Implementing Entity, the Implementing Entity may issue a "Participating Special Entity Certificate of Inclusion" to the Participating Special Entity that describes the scope of its Authorized Take coverage and sets forth the conservation measures the Participating Special Entity is required to implement. A Participating Special Entity Certificate of Inclusion template will be developed by the Implementing Entity and approved by the Wildlife Agencies prior to the Implementing Entity extending authorized take coverage to any Participating Special Entity. The Implementing Entity will enforce the terms of the Permits with regard to any such Participating Special Entity and will withdraw the Certificate of Inclusion and terminate any Authorized Take coverage extended to the Participating Special Entity if the Participating Special Entity fails to comply with such terms.

#### **7.4.3. Neighboring Landowners**

The Implementing Entity may extend Authorized Take coverage to owners of farmlands, as further described in SCVHP Chapter 10.2.7, and as provided herein. Owners of farmlands are eligible to receive Authorized Take coverage as a Neighboring Landowner for any portion of their lands that is within one mile of the boundary of lands included in the Reserve System. For purposes of this Section, "farmlands" means lands in production at the time applicable reserve unit is created on which normal agricultural practices are conducted, including, but not limited to, crop planting and production, irrigation and fertilization, soil tilling, crop harvesting, grazing including intensive livestock grazing on irrigated pasture, forage production, animal production and husbandry, and other associated activities such as fence construction and maintenance, vehicle or horse use, and construction and maintenance of typical farm outbuildings. Authorized Take for Neighboring Landowners will cover only normal agricultural practices. Participation in the SCVHP as a Neighboring Landowner is voluntary; farmland owners are not required by the SCVHP to seek Authorized Take coverage for normal agricultural practices.

#### **7.4.3.1. Activities Covered by Neighboring Landowner Take Authorization**

Neighboring Landowner Take Authorizations will cover routine agricultural practices, as further described in SCVHP Chapter 10.2.7, including without limitation normal crop rotation practices in which land is periodically fallowed and subsequently returned to cultivation.

#### **7.4.3.2. Limitations of Neighboring Landowner Take Authorizations**

Neighboring Landowner Take Authorizations are limited to the Take of three Covered Species whose populations have the potential to expand into farmlands from Reserve System lands. These three Covered Species are California red-legged frog, California tiger salamander, and western pond turtle. Neighboring Landowner Take Authorizations therefore will not cover take of other Covered Species or Take that occurred on farmlands before Reserve System lands were established within one mile of the farmlands. Neighboring Landowner Take Authorizations will cover only normal agricultural practices that occur within one mile of the boundary of Reserve System lands.

Neighboring Landowner Take Authorizations will not cover:

- conversion of farmlands to non-agricultural uses;
- conversion of crop lands to permanent crops, such as vineyards and orchards;
- non-agricultural uses;
- non-agricultural activities on farmlands; or
- pesticide use.

The Implementing Entity will establish the term of Neighboring Landowner Take Authorizations, which in no event will exceed the term of the Permits.

#### **7.4.3.3. Neighboring Landowner Certificates of Inclusion**

The Implementing Entity may extend Neighboring Landowner Take Authorization coverage to a farmland owner by issuing the landowner a Neighboring Landowner Certificate of Inclusion (Exhibit C) that reflects the requirements of Agreement Section 7.4.3 following the documentation of baseline environmental conditions on the farmlands. Farmland owners seeking a Neighboring Landowner Take Authorization may either retain their own qualified biologist to prepare a baseline conditions report or may request the Implementing Entity to evaluate and record the baseline environmental conditions. A farmland owner that uses the Implementing Entity for this purpose will reimburse the Implementing Entity's costs. Farmland owners are responsible for paying the costs of surveys and reports required to obtain a Neighboring Landowners Take Authorization. For purposes of this provision, a "qualified biologist" is a professional biologist approved by the Implementing Entity, USFWS and CDFG, as further described in SCVHP Chapter 6.8.5. The baseline conditions report must contain, at a minimum, a description of the extent and quality of Covered Species habitat present on the farmlands, the results of Covered Species surveys on the lands, and any records of Covered Species occurrences within one mile of the lands. The Implementing Entity will review all baseline conditions reports submitted by farmland owners to ensure that they are complete and based on accepted scientific practices for species and habitat surveys, and will reject incomplete or inadequate reports. Once the baseline environmental conditions have been documented in a complete and adequate baseline conditions report, and subject to the terms and

conditions in this Agreement Section 7.4.3 and SCVHP Chapter 10.2.7, the Implementing Entity will issue the owner of the farmlands a Certificate of Inclusion providing Neighboring Landowner Take Authorization coverage for normal agricultural practices on the land.

The Implementing Entity will require the covered farmland owner to sign the Neighboring Landowner Certificate of Inclusion. Neighboring Landowner Certificates of Inclusion will not be transferable. Subsequent owners of farmlands covered by a Neighboring Landowner Certificate of Inclusion must request the Implementing Entity to issue, and must sign, a new Neighboring Landowner Certificate of Inclusion, if they choose to continue enrollment. Subsequent owners of covered farmlands will not, however, be required to prepare, or to ask the Implementing Entity to prepare, a new baseline conditions report if there is no lapse in coverage under or compliance with the Neighboring Landowner Certificate of Inclusion.

The Implementing Entity will maintain a record of all Neighboring Landowner Certificates of Inclusion, and the size and location of lands covered by them, and will include a summary of this information in its Annual Report. Copies of Neighboring Landowner Certificates of Inclusion will be provided to the Wildlife Agencies upon request.

#### **7.5. Contra Costa Goldfields**

Nothing in the Permits is intended or will be construed to allow the Take of Contra Costa goldfields (*Lasthenia conjugens*), as further described in SCVHP Chapter 6.3.

#### **7.6. The Migratory Bird Treaty Act**

The Federal Permit will constitute a Special Purpose Permit under the Migratory Bird Treaty Act as provided at 50 Code of Federal Regulations section 21.27 for the Take of least Bell's vireo (*Vireo bellii pusillus*), subject to the terms and conditions specified in the Federal Permit, as of the Effective Date. The Special Purpose Permit will be valid for a period of three (3) years from the Effective Date, provided the Federal Permit remains in effect for such period. The Special Purpose Permit will be renewed in accordance with the Migratory Bird Treaty Act provided that the Permittees remain in compliance with the Federal Permit. Each such renewal will be valid for the maximum period allowable under the applicable regulations at the time of the renewal (which, as of the Effective Date, is three (3) years), provided that the Federal Permit remains in effect for such period. If and when any other Covered Species that is a migratory bird becomes a Federal Listed Species, the Federal Permit will automatically constitute a Special Purpose Permit for that species as of the date the Federal Permit becomes effective as to such species, as provided in Agreement Section 7.1.

#### **7.7. Activities Not Covered**

Projects and activities that are not Covered Activities, as described in SCVHP Chapter 2.4, will not receive Authorized Take Coverage and are not subject to the terms and conditions of the Permits.

#### **7.8. Relationship of SCVHP to Three Creeks Habitat Conservation Plan**

The Water District is expected to apply for separate incidental take permits from USFWS and the National Marine Fisheries Service to cover activities addressed in the "Three Creeks Habitat Conservation Plan" (the "3CHCP"). If issued, the Water District's 3CHCP incidental take permits will



be independent and severable from the SCVHP Federal Permit, such that, if the 3CHCP permits are subsequently suspended or revoked, such suspension or revocation will not, by itself, affect the SCVHP Federal Permit or the Permittees' obligations under the SCVHP Federal Permit, and vice versa. The Water District's 3CHCP incidental take permits are expected to cover some activities that are also SCVHP Covered Activities, such that the Water District will have incidental take authorization for certain SCVHP Covered Activities under both the SCVHP Federal Permit and the 3CHCP incidental take permits.

The Water District will be solely responsible for administering and implementing the 3CHCP. The Water District will coordinate with the Implementing Entity and the Wildlife Agencies regarding implementation of 3CHCP as appropriate to eliminate redundancies. If, and to the extent that, the 3CHCP requires mitigation for impacts also addressed by the SCVHP, the Parties agree that the Water District will not be required to implement the duplicative measure twice (e.g., will not both have to pay a fee under the SCVHP that is intended to fund land acquisition and also directly to fund a land acquisition under the 3CHCP to mitigate the impacts of the same project or activity). The Implementing Entity will be responsible for monitoring and reporting on measures implemented by the Water District that fulfill SCVHP requirements just as it is responsible for monitoring and reporting on other SCVHP measures, regardless of whether the measures also fulfill requirements under the 3CHCP.

Notwithstanding anything in this Agreement or the SCVHP to the contrary, the Parties further agree that conservation actions anticipated to be undertaken by the Water District in implementing the 3CHCP will be eligible to offset SCVHP Fees and, if implemented and approved by the Implementing Entity, may be credited against any SCVHP Fees the Water District may otherwise be obligated to pay, in the manner and to the extent provided in SCVHP Chapter 9.4.1.

## **8. CONDITIONS ON COVERED ACTIVITIES**

The impacts to Covered Species and natural communities resulting from Covered Activities will be minimized and mitigated by the implementation of the SCVHP Conservation Strategy, by avoidance and minimization measures for Covered Activities, and related application and survey requirements, described in SCVHP Chapter 6, and by the payment of certain fees that will be used to fund implementation of the SCVHP described in SCVHP Chapter 9. The measures described in SCVHP Chapter 6 and the fee requirements described in SCVHP Chapter 9 are referred to herein and in the SCVHP as “**Conditions on Covered Activities**” or “**Conditions.**” Most of these Conditions apply to specific types of Covered Activities; no individual Covered Activity is anticipated to need to comply with all Conditions. Instead, each Covered Activity will comply with certain applicable Conditions. The Permittees will ensure that all applicable Conditions are incorporated in Covered Activities, as provided in this Section.

### **8.1. Avoidance and Minimization of Impacts**

As further described in SCVHP Chapter 6, the SCVHP includes Conditions to avoid or minimize the Take of Covered Species resulting from Covered Activities. These Conditions are designed to form a regional program that will be implemented systematically to: prevent Take of individuals of certain

Covered Species; avoid impacts to Covered Species to the maximum extent practicable; minimize adverse effects on Covered Species and natural communities to the maximum extent practicable; and avoid and minimize direct and indirect impacts on wetlands and streams. Each Permittee will incorporate all applicable Conditions within all Covered Activities that it implements. In addition, the County and the Cities will require all applicable Conditions as conditions of approval for all Private Project Participant Covered Activities, and the Implementing Entity will ensure that the Conditions are incorporated in all Participating Special Entity Covered Activities.

#### **8.1.1. Avoidance and Minimization of Impacts to Species Protected under Laws other than the ESA or CESA**

All Covered Species that are bird species (western burrowing owl, least Bell's vireo, and tricolored blackbird) are protected under the Migratory Bird Treaty Act. As provided in Agreement Section 7.7, the Federal Permit will be a Special Purpose Permit under the Migratory Bird Treaty Act for the least Bell's vireo, which is a Federal Listed Species. However, unless and until the western burrowing owl or the tricolored blackbird become Federal Listed Species and the Federal Permit becomes a Special Purpose Permit for those species, the Migratory Bird Treaty Act will prohibit killing or possessing them or their young, nests, feathers, or eggs.

The Permits authorize Take of Covered Species only. As further described in Condition 1, Covered Activities must comply with applicable state and federal laws that protect species that are not Covered Species just as they would without the Permits.

#### **8.1.2. Exemptions from Conditions to Avoid and Minimize Impacts**

Certain Covered Activities will not disturb the ground or will have little measurable impact on Covered Species or natural communities. These Covered Activities will receive the same Authorized Take coverage as other Covered Activities. However, as further described in SCVHP Chapter 6.2 and SCVHP Table 6-1, some or all conditions on Covered Activities described SCVHP Chapter 6, including the requirement in SCVHP Chapter 6.8 to submit a Habitat Plan Application, will not apply to these Covered Activities.

### **8.2. SCVHP Fees**

As provided in this Section and further described in SCVHP Chapter 9, the Implementing Entity will use revenues generated from certain fees placed on Covered Activities to fund the implementation of the conservation strategy described in SCVHP Chapter 5. Such actions include, but are not limited to creation of the SCVHP Reserve System, management of Reserve System lands, monitoring of and reporting on SCVHP implementation, adaptive management, responses to Changed Circumstances, and related planning and administrative costs. These actions, together with the avoidance and minimization measures provided for in Agreement Section 8.1, will fulfill all requirements under the ESA and the NCCPA to minimize and mitigate for the impacts of Covered Activities on Covered Species and natural communities.

The SCVHP includes several types of fees, which are referred to collectively in this Agreement as the "SCVHP Fees." The SCVHP Fees, exemptions from the fees, fee credits, and the method of calculating the fees is further described in SCVHP Chapter 9.4.1.

### **8.2.1. Exemptions from SCVHP Fees**

Certain Covered Activities will not disturb the ground or will have little measurable impact on Covered Species or natural communities. As further described in SCVHP Chapter 6.2 and SCVHP Table 6-1, the requirement to pay SCVHP fees does not apply to these Covered Activities, except to the extent that the requirement applies to them expressly in SCVHP Chapter 9.4.1. These Covered Activities will receive the same Authorized Take coverage as other Covered Activities, and Take from these Covered Activities will be tracked and reported in the same way as Authorized Take from other Covered Activities. Covered Activities that are exempt from SCVHP Fees are further described in SCVHP Chapter 9.4.1.

### **8.2.2. Payment and Collection of Fees**

The Permittees will ensure that all applicable SCVHP Fees are paid, and all applicable fee credits are applied, for all Covered Activities, as further described in SCVHP Chapter 9.4.1. The County and the Cities will make payment of all applicable SCVHP Fees a condition of final approval for Private Project Participant Covered Activities; the Implementing Entity will require payment of all applicable SCVHP Fees for Participating Special Entity Covered Activities; and the Permittees will pay all applicable SCVHP Fees for Covered Activities that they implement. The Implementing Entity may require Participating Special Entities to pay an amount in addition to applicable SCVHP Fees to reimburse the Implementing Entity for costs associated with extending take coverage to Participating Species Entities and to help fund SCVHP conservation actions intended to contribute to the recovery of Covered Species.

The Cities and the County will collect fee payments from Private Project Participants and provide the fee revenues to the Implementing Entity at least annually. The Implementing Entity will collect all fee revenues, including fee payments from the Permittees for Covered Activities that they implement. The Implementing Entity will comply with all applicable provisions of the Mitigation Fee Act (Gov. Code §66000, et seq.) as to the deposit, accounting, expenditure and reporting of such fee revenues.

### **8.3. SCVHP Fee Credits**

As further described in SCVHP Chapter 8.6.7 and SCVHP Chapter 9.4.1, the Implementing Entity may approve SCVHP Fee credits for the conveyance of lands that are added to the Reserve System and for the implementation of SCVHP conservation actions. The SCVHP Fee credits may be used for some of the SCVHP Fees that apply to one or more Covered Activities, except that SCVHP Fee credits may not be used for the Wetland Fee. SCVHP Fee credits do not have any value except as credits for SCVHP Fees incurred during the Permit Term. SCVHP Fee credits remaining after the Permit Term will have no value, and no payment or “refund” will be made. Selling or trading of SCVHP Fee credits will not be allowed.

The Implementing Entity will prepare a written determination stating whether any proposed SCVHP Fee credit meets the requirements of the SCVHP and this Agreement, and whether, or to what extent, the credit is approved by the Implementing Entity. The written determination will include the amount of any approved credit. The amount of an approved SCVHP Fee credit may be

deducted from the SCVHP Fees that apply to any Covered Activity implemented by the Permittee, Private Project Proponent, or Participating Special Entity that received the approved credit.

The Implementing Entity may disapprove a proposed SCVHP Fee credit if it determines that approval of the credit would constrain the Implementing Entity's ability to meet Reserve System requirements or otherwise impede the successful implementation of the SCVHP, such as, for example, and without limitation, by creating a shortfall in fee revenues for Reserve System management or monitoring or by impairing the Implementing Entity's ability to meet the requirements of Agreement Section 9.4 or SCVHP Chapter 8.6.1.

#### **8.4. Timing of Fee Payment**

All applicable SCVHP Fees, subject to any SCVHP Fee credits, will be collected before the Covered Activity for which the fees are required is implemented. The County and the Cities will require Private Project Participants to pay all applicable fees before or concurrent with the issuance of a grading permit for each Private Project Proponents' Covered Activity. If a grading permit is not required for the Covered Activity, payment of the fees will be required before the first building or construction permit is issued. The Implementing Entity will require Participating Special Entities to pay all applicable fees before initiating ground-breaking activities for their Covered Activities, and the Permittees will pay all applicable fees before implementing any Covered Activity.

#### **8.5. Adjustment of Fees**

As further described in SCVHP Chapter 9.4.1, there are three ways in which the Implementing Entity will evaluate the amount of SCVHP Fees and adjust them as necessary to account for increases or decreases in the cost of implementing the SCVHP: by annual adjustments, by biennial reviews, and by periodic assessments. The Implementing Entity will adjust the rate of the SCVHP Fees annually, by the date established by the Implementing Entity for this adjustment, according to the indices and procedures described in Table 9-12 of the SCVHP, beginning the calendar year following the Effective Date. The date of the automatic update will be determined by the Implementing Entity's Governing Board within the first six months of Plan implementation. At least once every two (2) years, the Implementing Entity will review fee revenues and compare them to the actual and projected portion of SCVHP implementation costs that must be funded by fee revenues to determine whether the annual adjustments to SCVHP fees are sufficient to keep pace with actual costs and to provide the Implementing Entity an additional opportunity to adjust fees, if needed.

In addition, the Implementing Entity will conduct a periodic assessment concurrent with an annual adjustment of the SCVHP Fees to evaluate whether fee revenues are adequate to cover the appropriate portion of implementation costs, as described in SCVHP Chapter 9. The Implementing Entity will conduct the periodic assessment at least once every five (5) years, where year one (1) is the first full calendar year after the Effective Date.

SCVHP fees may be increased or decreased based on the results of the annual adjustments, biennial review, or periodic assessment. However, SCVHP fees must always be based on the mitigation requirement methodology described in SCVHP Chapter 9.4.1. The Permittees will not be required to

increase SCVHP Fees to address shortfalls in other sources of funding or to decrease the Fees in response to windfalls in other sources of funding.

## **9. CREATION OF RESERVE SYSTEM**

The creation and management of the Santa Clara Valley Habitat Plan Reserve System (the “**Reserve System**”) is an essential element of the SCVHP Conservation Strategy. The Implementing Entity will create the Reserve System on behalf of the Permittees as provided in this Section and further described in SCVHP Chapter 5 and SCVHP Chapter 8. With the exception of existing Santa Clara Valley Open Space Authority lands, described in Agreement Section 9.2, the Reserve System will be created by permanently protecting land containing certain terrestrial and aquatic land cover types and managing and monitoring them in perpetuity. Lands consistent with the conservation strategy that are owned by a Permittee may be added to the Reserve System upon approval by the Implementing Entity and Wildlife Agencies and protection through a conservation easement, as provided in this Section and as further described in SCVHP Chapter 5.2.3 and SCVHP Chapter 8.6.

Reserve System lands will be actively managed for the benefit of Covered Species, and habitat on Reserve System lands will be enhanced or restored where appropriate, to improve habitat for Covered Species and natural communities, as provided in Agreement Section 10 and further described in SCVHP Chapters 5.2.5, 5.3 and 5.4.

The Implementing Entity will create and complete the Reserve System according to prescribed deadlines as provided in Agreement Section 6.4.1 and further described in SCVHP Chapter 5.3.1, Table 5-14, and Chapter 8.12. In addition, lands must be added to the Reserve System at a pace that is roughly proportional to the rate at which Covered Activities are implemented and Authorized Take occurs, as provided in Agreement Section 9.4 and further described in SCVHP Chapter 8.6.1, even if this would require the Reserve System to be created and completed more quickly than needed to meet the deadlines.

### **9.1. Criteria for Reserve System Lands**

As further described in SCVHP Chapter 8.6, the Implementing Entity must obtain USFWS' and CDFG's advance approval for all lands added to the Reserve System, including lands owned by a Permittee, fee title transfers and conservation easement acquisitions; provided, however, that if either Wildlife Agency does not respond to a written request for approval of a proposed addition of lands from the Implementing Entity within thirty (30) days after receiving such a request, the Wildlife Agency will be deemed to have approved the acquisition for purposes of this Agreement, the SCVHP and the Permits.

Only lands that meet all of the following criteria may be counted toward the Reserve System requirements of the SCVHP.

- The lands must contribute to the SCVHP Conservation Strategy.
- The land has no hazardous materials or property encumbrances that conflict with the SCVHP Conservation Strategy.

- The lands must be consistent with SCVHP reserve design and assembly principles, as described in SCVHP Chapter 5.
- The lands must meet all relevant criteria in SCVHP Chapter 5.3.1 for landscape linkages, land cover types, plant populations, modeled species habitat, and species occupancy.
- The biological functions and values on the lands that contribute to the SCVHP Conservation Strategy must be permanently protected, with the exception of existing Santa Clara Valley Open Space Authority Land, described further in Agreement Section 9.2.
- A Reserve Unit Management Plan must be prepared for the lands, as provided in Agreement Section 10 and further described in SCVHP Chapter 5.2.5 and SCVHP Chapter 5.3.
- The lands were not used to fulfill mitigation requirements for a project or activity that is not a Covered Activity.

## **9.2. Permanent Protection of Reserve System Lands**

As provided in Agreement Section 9, Reserve System lands will be permanently protected. For purposes of the Permits, Reserve System lands will be regarded as permanently protected if the biological functions and values on the lands that contribute to the SCVHP Conservation Strategy are protected by a permanent, recorded conservation easement that meets the requirements of this Section and SCVHP Chapter 8.6.3. However, up to one-thousand (1,000) acres of land owned by the Santa Clara Valley Open Space Authority as of the Effective Date, on which the recordation of a conservation easement is precluded by law, may be added to the Reserve System without recordation of a conservation easement, provided the lands otherwise meet the requirements for Reserve System lands, as further described in SCVHP Chapter 5.2.3 and SCVHP Chapter 9.4.2.

### **9.2.1. Conservation Easements**

As further described in SCVHP Chapter 8.6.3, the Implementing Entity will negotiate the specific terms and conditions of conservation easements used to permanently protect Reserve System lands with each landowner on a case-by-case basis, based on site conditions, land uses, and Covered Species and habitat needs. However, all Reserve System conservation easements will comply with California Civil Code section 815 et seq., Government Code section 65965 et seq., and other applicable laws; will achieve certain objectives and prohibit certain uses, as further described in SCVHP Chapter 8.6.3; and will identify the Wildlife Agencies as third party beneficiaries for purposes of enforcing the terms of the easement. Reserve System conservation easements will be held by the Implementing Entity in most cases. If the Implementing Entity owns fee title to the land covered by the conservation easement, the conservation easement will be held by another conservation organization approved by the Wildlife Agencies. In addition, the Implementing Entity may, on a case-by-case basis, allow other conservation organizations approved by the Wildlife Agencies to hold Reserve System conservation easements, provided such conservation organizations enter into a binding agreement with the Implementing Entity in which they assume the obligation to enforce the terms of the conservation easement in accordance with the SCVHP, this Agreement, and the Permits and comply with all applicable legal requirements including, but not limited to, Government Code section 65965 et seq.

For purposes of lands added to the Reserve System, the Implementing Entity will use a conservation easement template agreed to by the Parties (Appendix H of the SCVHP). Reasonable variations from the template may be needed to address site-specific constraints. CDFG and USFWS, along with the Implementing Entity, must review and approve any modifications to the template easement prior to its execution.

### **9.3. Requirement for a Reserve Unit Management Plan**

As provided in Agreement Section 9 and Agreement Section 10, all Reserve System lands will be managed in perpetuity according to the applicable Reserve Unit Management Plan. Lands may be counted toward the Reserve System requirements of the SCVHP before a Reserve Unit Management Plan is prepared only if the lands are permanently protected and the fee owner of the lands is subject to an enforceable legal obligation to manage the lands, or to allow the lands to be managed, according to a Reserve Unit Management Plan.

### **9.4. Stay-Ahead or Rough Proportionality Requirement**

The Implementing Entity will ensure that lands are added to the Reserve System, and that required habitat restoration and creation occurs, at or faster than the pace at which Covered Activities impact habitat, which will fulfill the NCCPA's requirement to ensure that implementation of mitigation and conservation measures on a plan basis is roughly proportional in time and extent to the impact on habitat or covered species. (Cal. Fish & G. Code section 2820(b)(3)(D)(9).) This requirement is also referred to in the SCVHP as the "stay-ahead" requirement and will assist the USFWS in making a finding that the SCVHP will meet the requirement of Section 10(a)(2)(B)(ii) of the ESA. In order to make findings that the proposed impacts are mitigated to the maximum extent practicable, USFWS will consider temporal losses resulting from the time of impact relative to the time of mitigation. As further described in SCVHP Chapter 8.6.1, SCVHP Table 5-12 and SCVHP Table 5-14, the amount of each land cover type restored, created, and added to the Reserve System as a proportion of the total requirement for each land cover type will be equal to or greater than the impact on that land cover type as a proportion of the total impact expected by all Covered Activities. For example, at or before the time twenty-five percent (25%) of the expected impacts on mixed serpentine chaparral have occurred, the Implementing Entity will add twenty-five percent (25%) of the required acreage of mixed serpentine chaparral to the Reserve System. The Implementing Entity will in good faith attempt to maintain strict proportionality between creation of the Reserve System and the impacts of Covered Activities, but the Implementing Entity will fulfill the requirements of this Section and SCVHP Chapter 8.6.1 so long as it ensures that the pace at which the Reserve System is created, and at which required habitat restoration and creation occurs on Reserve System lands, does not fall behind the pace at which Covered Activities impact habitat by more than ten percent (10%) for each land cover type. As further described in SCVHP Chapter 8.6.1, SCVHP Chapter 5.4 and SCVHP Table 5-16, the Stay-Ahead provision also includes a requirement for acquisition of covered plant occurrences to stay ahead of impacts, with the exception of the Coyote ceanothus as described in SCVHP Chapter 5.4.11. SCVHP Chapter 8.6.1 also describes a Stay-Ahead provision specific to the Burrowing Owl Conservation Strategy. The Implementing Entity will measure and report on rough proportionality as described in Chapter 8.6.1.

#### **9.4.1. Reserve System Lands Acquired Using State or Federal Funding**

As provided in Agreement Section 13 and further described in SCVHP Chapter 9, the SCVHP funding strategy for completion of the Reserve System identifies and assumes contributions of state and federal funding. Lands added to the Reserve System using funds from state or federal agencies will be counted toward the Reserve System requirements of the SCVHP and the stay-ahead/rough proportionality requirement, but will not be credited toward SCVHP mitigation requirements.

#### **9.4.2. Failure to Stay Ahead or to Maintain Rough Proportionality**

If the Wildlife Agencies determine that the requirements of this Section or SCVHP Chapter 8.6.1 have not been fulfilled, they will so notify the Implementing Entity in writing, and the Implementing Entity and Wildlife Agencies will meet to develop a mutually agreeable plan of action that will fulfill such requirements, as further described in SCVHP Chapter 8.6.1. If the Wildlife Agencies determine specifically that the requirements of this Section and SCVHP Chapter 8.6.1 regarding the addition of land to the Reserve System have not been fulfilled, they may, by written notice to the Implementing Entity, require it to initiate the requirement to dedicate land in-lieu of SCVHP Fees set forth in Agreement Section 9.4.1. The Parties acknowledge that failure to fulfill the requirements of SCVHP Chapter 8.6.1 would constitute a violation of the Federal and State Permits and that the Wildlife Agencies will take appropriate responsive actions to address any such violation in accordance with the ESA and the NCCPA, which could include suspension or revocation of the Permits, in whole or in part.

##### **9.4.2.1. NCCPA Procedure for Addressing Failure to Maintain Rough Proportionality**

In addition to the response described in Agreement Section 9.4.2, SCVHP Chapter 8.6.1 and SCVHP Chapter 9.4.4, the NCCPA requires a specific procedure for responding to a failure to maintain rough proportionality. This Section fulfills that requirement. If CDFG determines that the requirements of this Section or SCVHP Chapter 8.6.1 have not been fulfilled, with or without the concurrence of USFWS, the Implementing Entity will either regain rough proportionality within forty-five (45) days or will enter into an agreement with CDFG within forty-five (45) days, which will set a course of action to expeditiously regain rough proportionality. The agreement may include any of a variety of commitments or adjustments to the SCVHP designed to regain rough proportionality, including but not limited to, a plan to acquire, restore, or enhance lands of the appropriate land cover or plant population type expeditiously. However, if USFWS concurs with CDFG's determination, and the Implementing Entity and the Wildlife Agencies meet to develop a plan of action, as described above, the agreement will be based on that plan of action. The Implementing Entity will provide written notice of the agreement to the other Permittees. Each Permittee will implement all actions set forth in the agreement that apply to the Permittee.

If the Implementing Entity does not regain rough proportionality within forty-five (45) days and does not enter into an agreement with CDFG within forty-five (45) days setting a course of action to regain rough proportionality, CDFG will suspend or revoke the State Permit, in whole or in part, pursuant to California Fish and Game Code section 2820, subdivision (c). The Parties agree that partial suspension or revocation may include removal of one or more Covered Species for purposes



of the State Permit or reducing the geographic scope of Authorized Take under the State Permit. Before suspending or revoking the State Permit *in whole* due to a failure to maintain rough proportionality, CDFG will meet with the Permittees to determine whether mutually agreeable modifications to the SCVHP would obviate a suspension or revocation *in whole*. The Parties agree that if CDFG suspends or revokes the State Permit, the Permittees may, based on the SCVHP, apply for one or more CESA incidental take permits under section 2081, subdivision (b), of the California Fish and Game Code to replace the State Permit.

If the NCCPA procedure for addressing a failure to maintain rough proportionality in California Fish and Game Code section 2820 is amended, the new procedure shall supersede the procedure in this Section 9.4.2.1 to the extent they are inconsistent.

The Implementing Entity will follow the same procedure with USFWS as described in this section 9.4.2.1 for responding to a failure to maintain rough proportionality for purposes of the ESA.

#### **9.4.3. Conveyance of Land in Lieu of SCVHP Fees to Maintain Rough Proportionality**

If the Implementing Entity determines at any time that the pace at which lands are added to the Reserve System is likely to fail to meet the requirements of this Agreement Section 9.4, the Implementing Entity may, after consultation with the other Permittees, require that some or all Permittees provide, and require Third Party Participants to provide, land in lieu of fees, as provided in Agreement Section 8.3 and further described in SCVHP Chapters 8.6.1 and 8.6.7. The Implementing Entity will provide written notice thereof to the other Permittees. The Implementing Entity's notice will recommend a scope of the land in lieu of fee requirement, for example, applying the land in lieu of fee requirement to Covered Activities that will impact ten (10) acres or more. All Permittees will thereafter apply the recommended land in lieu of fee requirement to Covered Activities that they implement; the Implementing Entity will apply the requirement to Participating Special Entities; and the County and Cities will consider applying the requirement to Private Project Participants. However, SCVHP Fee credits derived from the implementation of conservation actions specifically approved for SCVHP Fee credit in SCVHP Chapter 9.4.1 may be used regardless of a land in lieu of fee requirement from the Implementing Entity. The County and Cities acknowledge that failure to apply the land in lieu of fee requirement to Private Project Participants when needed to meet the requirements of this Agreement Section 9.4 may result in suspension or revocation of the Permits.

The Implementing Entity may terminate the land in lieu of fee requirement only after it determines that the pace at which lands added to the Reserve System without the requirement will likely meet the requirements of this Agreement Section 9.4. Upon making such a determination, the Implementing Entity will so notify the other Permittees in writing, and the Permittees may thereafter terminate the requirement with regard to their own Covered Activities and to Third Party Participants. However, if the Implementing Entity initiated the requirement because it was required to do so by the Wildlife Agencies as provided in Agreement Section 9.4.2, it may terminate the land in lieu of fee requirement only with the approval of the Wildlife Agencies, which approval will not be withheld unreasonably.

### **9.5. Additional Criteria for Lands Conveyed in Lieu of SCVHP Fees**

As provided in Agreement Section 8.3 and Agreement Section 9.4.1, under certain circumstances lands may be conveyed to the Reserve System in lieu of payment of some SCVHP Fees that apply to one or more Covered Activities. As further described in SCVHP Chapter 8.6.7, such lands may be added to the Reserve System and counted toward the Reserve System requirements of the SCVHP, if the lands:

- meet the criteria for Reserve System Lands in Agreement Section 9.1;
- are approved for inclusion in the Reserve System by the Implementing Entity and the Wildlife Agencies in accordance with Agreement Section 9.1; and
- are within an area designated as high or moderate priority for acquisition, as further described in SCVHP Chapter 5 and SCVHP Figure 5-8, or have unique or exceptional habitat values that meet the criteria for such high or moderate priority areas.

### **9.6. Lands Conveyed by Entities other than Permittees**

Lands acquired or owned by any Permittee that meet the requirements of Agreement Section 9.1 may be added to the Reserve System and counted toward the Reserve System requirements of the SCVHP, as further described in SCVHP Chapter 8.6.2.

#### **9.6.1. Lands in Private Mitigation Banks**

Lands in private mitigation banks within the Permit Area can be counted toward the Reserve System requirements of the SCVHP as described in SCVHP Chapter 8.6.2. With the Implementing Entity's prior approval, a Permittee or Third Party Participant may purchase credits at a private mitigation bank to fulfill the requirements of the SCVHP only if the bank occurs within the Permit Area and meets all relevant requirements pertaining to the Reserve System, habitat enhancement, adaptive management, and monitoring described in SCVHP Chapter 5 and SCVHP Chapter 7.

### **9.7. Gifts of Land**

The Implementing Entity may accept lands in fee title, or conservation easements on lands, as a gift or charitable donation. Such lands may be added to the Reserve System only if they meet the criteria in Agreement Section 9.1 and the nature of the real property interest is consistent with the requirements of Agreement Section 9.2. The Implementing Entity may sell or exchange lands it receives as a gift or donation that do not meet the criteria in Agreement Section 9.1 or the requirements of Agreement Section 9.2.

## **10. MANAGEMENT OF RESERVE SYSTEM LANDS**

The Implementing Entity, on behalf of the Permittees, will ensure that Reserve System lands are managed as provided in this Section and further described in SCVHP Chapters 5.2.5, 5.3, and 5.4. The Implementing Entity may delegate management responsibility to other Parties or qualified third parties, including but not limited to public agencies, private conservation organizations, university scientists, and contractors. However, the Implementing Entity or any successor will be responsible for ensuring the management of Reserve System lands in perpetuity.

## **10.1. Reserve Unit Management Plans**

The Implementing Entity will ensure that all Reserve System lands are managed according to appropriate Reserve Unit Management Plans. As further described in SCVHP Chapter 5.2.5, Reserve Unit Management Plans will be prepared for each reserve unit within the Reserve System to identify, on the basis of site-specific conditions, the management and maintenance actions necessary to ensure that SCHVP objectives regarding ecosystem characteristics and functions are maintained and enhanced, and to achieve other objectives, as further described in SCVHP Chapter 5.2.5.

### **10.1.1. Role of the Wildlife Agencies in Preparation of Reserve Unit Management Plans**

All Reserve Unit Management Plans must be approved by the Wildlife Agencies. The Wildlife Agencies will review each draft Reserve Unit Management Plan and provide comments to the Implementing Entity within sixty (60) days after receiving the draft plan. The Implementing Entity will revise the draft plan based on the Wildlife Agencies' comments, if any, and will provide a revised draft to the Wildlife Agencies, which will have an additional sixty (60) day review period. If an initial draft Reserve Unit Management Plan or any subsequent revised draft Reserve Unit Management Plan adequately addresses a Wildlife Agency's comments, the Wildlife Agency will so notify the Implementing Entity within sixty (60) days, and the Reserve Unit Management Plan will thereafter be deemed to be approved by that Wildlife Agency for purposes of the Permits. In addition, if a Wildlife Agency does not provide comments within sixty (60) days after receiving the revised draft Reserve Unit Management Plan, the Wildlife Agency will thereafter be deemed to have approved the revised draft plan for purposes of this Agreement, the SCVHP and the Permits. The Implementing Entity will incorporate comments submitted by the Wildlife Agency in the revised draft Reserve Unit Management Plan to the extent that the Implementing Entity determines the comments can be incorporated. In the event that the Implementing Entity determines that some or all of the Wildlife Agency comments cannot be incorporated, it will notify the Wildlife Agencies of its determination and the basis for such. The Implementing Agency will then work with the Wildlife Agencies to determine if other measures can be developed that adequately address the Wildlife Agencies' concerns.

The same Wildlife Agency review procedure will apply to all major revisions to Reserve Unit Management Plans.

### **10.1.2. Preparation and Revision of Reserve Unit Management Plans**

As further described in SCVHP Chapter 5.2.5 and SCVHP Chapter 5.3, the Implementing Entity will prepare a Reserve Unit Management Plan for each reserve unit within the Reserve System as soon as reasonably possible. The Implementing Entity will prepare a draft Reserve Unit Management Plan for Wildlife Agency review not later than five (5) years after the first parcel has been acquired within the reserve unit. Until the Reserve Unit Management Plan has been approved by the Wildlife Agencies, the Implementing Entity will manage the reserve unit based on the best available information and management methods derived from other Reserve Unit Management Plans or from other land management in the Permit Area.

Following the initial approval of a Reserve Unit Management Plan, the Implementing Entity will periodically update each Reserve Unit Management Plan as new lands are added to the reserve unit to include new management and monitoring methods, if any, needed for the new lands. The Implementing Entity will also review and, if necessary, revise all Reserve Unit Management Plans every five (5) years based on information provided through the SCVHP monitoring and adaptive management program described in SCVHP Chapter 7 and relevant outside research.

#### **10.2. Reserve Unit Management Plan Components**

The Implementing Entity will ensure that each Reserve Unit Management Plan includes the components identified in SCVHP Chapter 5.2.5 and SCVHP Chapter 5.3.2.

#### **10.3. Recreational Uses**

Recreational and educational uses will be allowed on Reserve System lands where the Implementing Entity determines that such uses would be compatible with the preservation and enhancement of Covered Species and natural communities. The Implementing Entity will ensure that a recreational uses strategy is included in all Reserve Unit Management Plans for reserve units on which educational or recreational uses will be allowed, as further described in SCVHP Chapter 6.4.6. The Implementing Entity will not allow recreational uses within any reserve unit of the Reserve System until the Wildlife Agencies have approved a Reserve Unit Management Plan that includes a recreational uses strategy for the unit in accordance with Agreement Section 10.1.1; provided, however, that existing recreational uses on lands incorporated into the Reserve System from existing open space (e.g., County Parks) will continue until the Reserve Unit Management Plan and associated recreational use strategy is completed.

#### **10.4. Monitoring Program**

All Reserve System lands will be monitored as further described in SCVHP Chapter 7. As further described in SCVHP Chapter 5.2.5 and SCVHP Chapter 7, the Implementing Entity will prepare and implement a comprehensive monitoring program for the Reserve System within five (5) years after the Effective Date.

#### **10.5. Technical Advisory Committee**

As further described in SCVHP Chapter 8.2.4, the Implementing Entity will create a technical advisory committee composed of but not limited to representatives of each land management agency that manages lands that are part of the Reserve System, including each Permittee that manages such lands, and the Wildlife Agencies, with the USFWS participating in an *ex officio* capacity. The purpose of the technical advisory committee will be to share information regarding land management generally and to coordinate the management of Reserve System lands.

### **11. MONITORING, ADAPTIVE MANAGEMENT AND CHANGED CIRCUMSTANCES**

The Implementing Entity, on behalf of the Permittees, will implement the SCVHP monitoring and adaptive management program as provided in this Section and further described in SCVHP Chapter 7. The Implementing Entity may delegate monitoring responsibilities to other Parties or qualified

third parties, including but not limited to public agencies, private conservation organizations, university scientists, and contractors.

The overarching purpose of the SCVHP monitoring and adaptive management program is to inform and refine SCVHP implementation so that it may achieve the goals and objectives of the SCVHP Conservation Strategy. The Implementing Entity will administer the adaptive management process by using information gathered from the monitoring program to inform and refine the design and management of the Reserve System. The Implementing Entity will also incorporate the recommendations of science advisors and other experts in the design and management of the Reserve System, as appropriate, and will consider the cost of implementing the monitoring and adaptive management program in its budget analysis and funding decisions.

The scope of the SCVHP monitoring and adaptive management program is limited by the regulatory assurances provided by the Wildlife Agencies, as provided in Agreement Section 12.

### **11.1. Monitoring**

The Implementing Entity will conduct three main types of monitoring, as further described in SCVHP Chapter 7.2.1: compliance monitoring, effectiveness monitoring, and targeted studies. The Implementing Entity will provide the results of all SCVHP monitoring annually in its Annual Report. Compliance monitoring, also known as implementation monitoring, will track the status of SCVHP implementation and verify that the Implementing Entity is meeting the terms and conditions of the Permits. Effectiveness monitoring assesses the biological success of the Plan—specifically, it evaluates the implementation and success of the conservation strategy described in SCVHP Chapter 5. Targeted studies will identify the best methodologies for monitoring, provide information about the efficacy of Reserve System management techniques, and resolve critical uncertainties in order to improve Reserve System management.

### **11.2. Adaptive Management**

The Implementing Entity will implement the SCVHP adaptive management program, as further described in SCVHP Chapters 7.1.2, 8.3.8, and 9.3.5. The purpose of adaptive management will be to adapt the design and management of the Reserve System in order to maximize the likelihood of the successful implementation of the SCVHP Conservation Strategy. The Implementing Entity will have ultimate responsibility for implementing the adaptive management program and will ultimately decide what adaptations will be made in the management of Reserve System lands. However, the Implementing Entity will consider the advice of the Wildlife Agencies, science advisors, the Independent Conservation Assessment Team, other land management agencies, and the public, as provided in this Section and as further described in SCVHP Chapter 7.2.3. In addition, any major changes in the adaptive management program will require the approval of the Wildlife Agencies prior to implementation, including, but not limited to, any proposed actions that would be inconsistent with the SCVHP or detrimental to a Covered Species, introducing new and untested management techniques, discontinuing and replacing ineffective management techniques that are recommended in the Conservation Strategy, or applying management techniques on a much larger or smaller scale than envisioned in the SCVHP.

#### **11.2.1. Role of the Wildlife Agencies**

The Wildlife Agencies will provide biological expertise and policy-level recommendations to the Implementing Entity regarding potential changes to the design and management of the Reserve System based on the results of monitoring and the advice of science advisors and the Independent Conservation Assessment Team, as further described in SCVHP Chapter 7.2.3. The Implementing Entity will confer with the Wildlife Agencies before initiating substantial adaptations to the design or management of the Reserve System. The Implementing Entity and Wildlife Agencies will attempt in good faith to reach agreement regarding any such adaptations or alternative adaptations that the Wildlife Agencies may propose. If they cannot reach agreement, any of them may initiate the dispute resolution procedure provided in Agreement Section 6.6.

#### **11.2.2. Role of Science Advisors**

The Implementing Entity will consult with science advisors regarding SCVHP implementation when needed to obtain expert scientific advice and recommendation regarding key scientific aspects of SCVHP implementation, such as the design, management and monitoring of the Reserve System, as further described in SCVHP Chapter 7.2.3. Science advisors will be selected by the Implementing Entity, with input from the Wildlife Agencies. For purposes of this Agreement, “science advisors” means scientists or resource managers with expertise in one or more of the following areas:

- The biology of Covered Species;
- Landscape ecology;
- Natural communities in the Reserve System;
- Ecological processes;
- Resource management;
- Biological monitoring; or
- Statistical analysis and experimental design.

#### **11.2.3. Role of the Independent Conservation Assessment Team**

The Implementing Entity will select and convene an “**Independent Conservation Assessment Team**” at least once every five (5) years to evaluate SCVHP implementation and recommend ways to improve progress toward achieving the SCVHP Conservation Strategy’s goals and objectives, as further described in SCVHP Chapter 7.2.3. The Independent Conservation Assessment Team will be composed of independent scientists and resources managers who are recognized experts in their fields. The Implementing Entity will consult with the Wildlife Agencies regarding the selection of members of the Independent Conservation Assessment Team. The Implementing Entity, in consultation with the Wildlife Agencies, will determine the scope and focus of the Independent Conservation Assessment Team’s review based on the most relevant issues and circumstances at the time of each review. However, each review will in any case include a program-level evaluation of recommendations for the following:

- The design of the Reserve System and the success of habitat restoration efforts;
- The appropriateness of monitoring and methods for purposes of achieving the SCVHP Conservation Strategy goals and objectives;

- The appropriateness of the interpretation of monitoring results as reflected in the five (5) most recent Annual Reports; and
- Adaptations that may be needed in the management of Reserve System lands.

#### **11.2.4. Advice from Other Land Management Agencies**

The Implementing Entity will from time to time consult with land management agencies in the Permit Area to share information regarding land management generally and to coordinate management of lands adjacent to Reserve System lands with the management of Reserve System lands. Organizations consulted for advice could include, but will not be limited to, private non-profit conservation organizations that are active in or near the Permit Area.

#### **11.2.5. Advice from the Public**

The Implementing Entity will provide members of the public with opportunities to learn about the status of SCVHP implementation and to provide advice regarding the adaptive management program, as further described in SCVHP Chapter 7 and SCVHP Chapter 8.2.7.

#### **11.2.6. No Increase in Take**

Section 11.2 of this Agreement does not authorize any adaptations to the design or management of the Reserve System that would result in an increase in the amount and nature of Authorized Take, or increase the impacts of Authorized Take, of Covered Species beyond that analyzed in the SCVHP and any Amendments thereto. Any such modification must be reviewed as a Permit Amendment under Agreement Section 15.

### **11.3. Changed Circumstances**

The Implementing Entity will implement responses to Changed Circumstances as provided in this Section and further described in SCVHP Chapter 10.2.1. Changed Circumstances identified and planned for in the SCVHP are contained in SCVHP Chapter 10.2.1. In the event a Changed Circumstance identified in SCVHP Chapter 10.2.1 occurs, the Implementing Entity will implement the remedial measures or actions prescribed in SCVHP Chapter 10.2.1 for that Changed Circumstance. Neither the Implementing Entity nor any other Permittee or Third Party Participant will be required to take any additional action to respond to a Changed Circumstance (i.e., any action not otherwise required by the Permits), except as described in SCVHP Chapter 10.2.1.

Changed Circumstances are provided for in the SCVHP and therefore are not Unforeseen Circumstances. The Permittees' responses to Changed Circumstances, as well as the funding to assure that the responses are implemented, are described in the SCVHP. Therefore, Changed Circumstances do not require an Amendment of the SCVHP or the Permits. The Parties agree that SCVHP Chapter 10.2.1 identifies all Changed Circumstances and describes appropriate and adequate responses for them. Other changes not identified as Changed Circumstances will be treated as Unforeseen Circumstances, as provided in Agreement Section 12.

#### **11.3.1. Initiating Responses to Changed Circumstances**

The Implementing Entity will notify the Wildlife Agencies within seven (7) days after learning that any of the Changed Circumstances listed in SCVHP Chapter 10.2.1 has occurred. The Implementing

Entity will respond to Changed Circumstances as described in SCVHP Chapter 10.2.1.

If a Wildlife Agency determines that a Changed Circumstance has occurred and that the Implementing Entity has not responded as described in SCVHP Chapter 10.2.1, the Wildlife Agency will so notify the Implementing Entity, specifically identifying the Changed Circumstance. After receiving the Wildlife Agency's notice, the Implementing Entity will initiate responsive actions in the manner described in SCVHP Chapter 10.2.1.

After it has initiated remedial measures to a Changed Circumstance as described in SCVHP Chapter 10.2.1, the Implementing Entity will promptly inform the Wildlife Agencies of its actions. The Implementing Entity will continue implementation of any such remedial measures to completion and will describe in its Annual Report for that year the Changed Circumstance and the remedial measures implemented. Subsequent Annual Reports will track the response of the Reserve System and the Covered Species to evaluate whether remedial measures implemented as a result of Changed Circumstances have been effective.

## **12. REGULATORY ASSURANCES**

The Wildlife Agencies acknowledge that the Permittees have agreed to take on the substantial responsibility of developing and implementing the SCVHP in large part to obtain regulatory assurances, as provided in the ESA and the NCCPA and further described in this Section and SCVHP Chapter 10.2.

### **12.1. ESA Regulatory Assurances**

Provided that the Permittees have complied with their obligations under this Agreement, the SCVHP and the Federal Permit, USFWS can require a Permittee or Third Party Participant to provide additional mitigation beyond that provided for in the SCVHP only with its consent and only under Unforeseen Circumstances, in accordance with the "No Surprises" regulations at 50 Code of Federal Regulations section 17.22(b)(5) and section 17.32(b)(5).

### **12.2. NCCPA Regulatory Assurances**

As long as the Permittees are properly implementing this Agreement, the SCVHP, and the State Permit, CDFG will not seek to impose on the Permittees or Third Party Participants, for purposes of compliance with the NCCPA or CESA, any avoidance, minimization, mitigation, or conservation measures or requirements regarding the impacts of Covered Activities on Covered Species within the Permit Area beyond those required by this Agreement, the SCVHP, and the State Permit. If there are Unforeseen Circumstances, additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources will not be required without the consent of Permittees for the term of this Agreement, unless CDFG determines that the SCVHP is not being implemented consistent with the substantive terms of this Agreement, the SCVHP, and the State Permit.

The provisions of this Agreement and the SCVHP that address Changed Circumstances are not Unforeseen Circumstances and therefore are not subject to these assurances. However, CDFG acknowledges that the Changed Circumstances provisions of the SCVHP are not intended to require



modifications to the SCVHP that would impose significant additional burdens on Permittees or Third Party Participants.

### **12.3. Interim Obligations upon a Finding of Unforeseen Circumstances**

If a Wildlife Agency finds that an Unforeseen Circumstance has occurred with regard to a Covered Species and that additional mitigation measures are required for the Covered Species as a result, during the period necessary to determine the nature and location of the additional or modified mitigation, the Permittees will avoid causing an appreciable reduction in the likelihood of the survival and recovery of the affected species. The Permittees will not be responsible for implementing any additional mitigation measures or modifications, unless the Permittees consent to do so.

### **12.4. Section 7 Consultations regarding Covered Activities**

Nothing in this Agreement is intended to alter the obligation of a federal agency to consult with USFWS pursuant to Section 7 of the ESA (16 U.S.C. §1536(a)); the Parties understand that the assurances described in Agreement Section 12.1 cannot be provided to federal agencies. Unless otherwise required by law or regulation, in any consultation under Section 7 of the ESA involving the Permittees or an existing or prospective Third Party Participant and a proposed public or private project in the Permit Area that may adversely affect one or more Covered Species that are Federal Listed Species, USFWS will ensure that the biological opinion for the proposed project is consistent with the biological opinion issued for the SCVHP and the Federal Permit, provided that the proposed project and associated effects are consistent with the Covered Activities and effects analyzed in the SCVHP and the Federal Permit. Unless otherwise required by law or regulation, USFWS will not impose measures on a Permittee or an existing or prospective Third Party Participant in excess of those that have been or will be required by the Permits.

### **12.5. Assurances for Third Party Participants**

Pursuant to the “No Surprises” regulations described in Agreement Section 12.1, in the event of a finding of Unforeseen Circumstances, USFWS cannot require the commitment of additional land, water or financial compensation without the consent of the affected Permittee or Third Party Participant, provided that the Permittees have complied with their obligations under the Federal Permit. Likewise, as provided in Agreement Section 12.2, as long as the Permittees are properly implementing this Agreement, the SCVHP, and the State Permit, CDFG will not seek to impose on any Permittee or Third Party Participant, for purposes of compliance with the NCCPA or CESA, any avoidance, minimization, mitigation, or conservation measures or requirements regarding the impacts of Covered Activities on Covered Species within the Permit Area beyond those required by this Agreement, the SCVHP, and the State Permit. If there are Unforeseen Circumstances, additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources will not be required of a Third Party Participant without its consent for the term of this Agreement, unless CDFG determines that the SCVHP is not being implemented consistent with the substantive terms of this Agreement, the SCVHP, and the State Permit.

Nothing in this Agreement will preclude the Permittees from imposing on Third Party Participants any mitigation, compensation, or other requirements in excess of those required by the Permits for impacts other than impacts of Covered Activities on Covered Species. Such other impacts may include, but are not limited to, impacts on parks, recreational facilities, and agriculture.

### **13. FUNDING**

The Implementing Entity, County, Cities, Water District and VTA will ensure that all required mitigation, conservation, monitoring, and reporting measures are adequately funded throughout the term of this Agreement, and that certain monitoring, reporting and adaptive management measures are adequately funded in perpetuity. The Permittees do not intend to use, nor are they required to use, funds from their respective general funds to implement the SCVHP; rather they intend to obtain sufficient funds through a comprehensive strategy further described in SCVHP Chapter 9 that includes: fees and dedications from Covered Activities; federal and state grants; grants from nonprofits and foundations; and ongoing conservation efforts by local and state agencies that have a demonstrated record of acquiring and managing lands for conservation purposes in the Permit Area. The Permittees may use or establish other local funding measures, including, but not limited to, utility surcharges, special taxes or assessments, or bonds, to the extent allowed by law. The Permittees are responsible to seek all feasible increases in revenues that are necessary to keep pace with rising costs, as described in SCVHP Chapter 9. Each Permittee will promptly notify the Wildlife Agencies of any material change in the Permittee's financial ability to fulfill its obligations under this Agreement. In addition, the Implementing Entity will include in its Annual Report reasonably available financial information to demonstrate the Permittees' collective ability to fulfill their obligations under this Agreement in light of a material change in a Permittee's finances, if any.

As further provided in Agreement Section 18.8, this Agreement does not require the obligation, appropriation, or expenditure of any money without express authorization by, as applicable, the County Board of Supervisors, appropriate City Councils and/or governing boards of the Implementing Entity, Water District, and VTA.

#### **13.1. Funding for Management and Monitoring in Perpetuity**

As further described in SCVHP Chapter 9.4.4, the Permittees will manage the Reserve System in perpetuity in accordance with the requirements of the SCVHP, including applicable SCVHP adaptive management requirements and monitoring requirements. The Permittees anticipate that Reserve System management obligations will be fully funded by interest on the endowment created by the Endowment Fee, a component of the SCVHP Fees.

The Permittees' obligations with regard to SCVHP requirements other than Reserve System management requirements will terminate upon the termination of the Permits.

#### **13.2. Effect of Inadequate Funding**

In the event there is inadequate funding to implement the SCVHP, the Wildlife Agencies will assess the impact of the funding deficiency on the scope and validity of the Permits. Unless the Permittees

exercise the authority to withdraw, as provided in Agreement Section 17, or the Wildlife Agencies revoke the Permits, in whole or in part, as provided in Agreement Section 16, the Parties agree that they will meet and confer to develop a strategy to address the funding shortfall and to undertake all practicable efforts to maintain both the level of conservation provided under the SCVHP and the level of Authorized Take coverage afforded by the Permits until the funding deficiency can be remedied. The strategy to address a funding shortfall may include, but is not necessarily limited to, the actions described in SCVHP Chapter 9.4.4. However, the Permittees do not intend to, nor are they required to use, funds from their respective general funds to implement the SCVHP in the event of funding shortfalls, either in the short term or the long term.

If overall SCVHP fee revenues for the term of the Permits fall short of SCVHP projections because fewer Covered Activities are proposed or implemented, the resulting shortfall in SCVHP funding could prevent or constrain the Permittees' ability to implement the SCVHP fully. If it appears that the allowed Authorized Take will not be used during the term of the Permits, substantially reducing SCVHP fee revenues, the Parties anticipate that the Permittees will apply for an extension of the Permits in accordance with Agreement Section 17.4 to allow the full use of Authorized Take and full implementation of the SVHP, or will apply for a Permit modification or amendment in accordance with Agreement Section 15.5.

### **13.3. State and Federal Funding**

As further described in SCVHP Chapter 9.4.3, through the SCVHP and this Agreement, USFWS and CDFG will use their best efforts to contribute 14,900 acres of land, which will be administered, managed, and monitored by the Implementing Entity, to the Reserve System. The funds provided to acquire the 14,900 acres of land could come from a variety of sources, including funds administered directly by USFWS and CDFG, as well as funds administered by the Wildlife Conservation Board, the California Coastal Conservancy, California Department of Parks and Recreation, and other state and federal sources. If, after the exercise of all available authority and use of all available resources, state and federal funds are unable to contribute 14,900 acres to the Reserve System, the Implementing Entity, the Permittees, CDFG and USFWS will reevaluate the SCVHP and work together to develop or identify an alternative funding mechanism.

The Implementing Entity will track state and federal funds progress toward the goal of contributing 14,900 acres, measured by the number of acres added to the SCVHP Reserve System, and will include a summary of the progress in each report it prepares under Agreement Section 14.1. State and federal funds will be counted only toward that portion of the Reserve System that contributes to the recovery of Covered Species. If, for any acquisition of lands that are added to the Reserve System, state or federal funding is used to pay a portion of the overall acquisition costs, the number of acres counted toward this goal will be the portion of the total acres acquired that reflects the proportion of total acquisition costs paid with state or federal funds.

If a state or federal agency manages, or funds the management of, lands acquired with state or federal funds, the number of acres from state and federal funds contributing to the Reserve System will be reduced from 14,900 acres in recognition of the contribution of management funding, as

further described in SCVHP Chapter 9.4.3. The amount of the reduction will be accounted for by mutual agreement among USFWS, CDFG and the Implementing Entity.

## **14. REPORTING AND INFORMATION MANAGEMENT**

The Implementing Entity, on behalf of the Permittees, will report on and manage information regarding SCVHP implementation as provided in this Section and further described in SCVHP Chapters 7 and 8.11. The Implementing Entity may delegate reporting and information management tasks in this Section and the SCVHP to other Parties or qualified third parties, including universities, scientists and other contractors. However, the Implementing Entity will remain solely responsible for ensuring implementation of such tasks, on behalf of the Permittees.

### **14.1. Annual Report**

The Implementing Entity will prepare an annual report on implementation of the SCVHP (the “**Annual Report**”), as further described in SCVHP Chapter 8.11. The Annual Report will summarize actions taken to implement the SCVHP during the previous calendar year and will be submitted to the Wildlife Agencies by March 15 of the following calendar year, beginning the calendar year after the first full calendar year of implementation. The Annual Report will: provide information necessary to demonstrate that the SCVHP is being implemented in accordance with the Permits; include or describe the applications and approvals for take authorization, including take authorizations for Covered Activities that are exempt from SCVHP Fees or Conditions; identify any significant problems encountered during implementation, including any Changed Circumstances or Unforeseen Circumstances, and any remedial measures taken; identify issues that require consultation with the Wildlife Agencies; and identify proposed Minor Modifications or Amendments that would support successful implementation of the SCVHP. The Implementing Entity will provide a copy of the Annual Report to all Parties. The Implementing Entity will also create and maintain an Internet website for the public distribution of information regarding SCVHP implementation and will post each Annual Report on the website.

### **14.2. Monitoring Results**

As provided in Agreement Section 11.1, the Implementing Entity will provide the results of compliance monitoring, effectiveness monitoring and targeted studies annually in the Annual Report. The Parties will use the results of the Implementing Entity’s monitoring to ensure that the SCVHP is being properly implemented and to measure the Implementing Entity’s progress toward the successful implementation of the SCVHP Conservation Strategy (SCVHP Chapter 5), as further described in SCVHP Chapters 7 and 8.10.2.

### **14.3. Information Management**

Within one (1) year after the adoption of the last implementing ordinance as provided in Agreement Section 7.4.1.3, the Implementing Entity will develop and maintain a comprehensive data repository for compliance tracking information and other relevant information regarding SCVHP implementation, as further described in SCVHP Chapter 8.10.1. The Implementing Entity will make the data repository accessible to the Parties, including the Wildlife Agencies. The Wildlife

Agencies will keep confidential sensitive species information to the extent permitted by the Freedom of Information Act, the California Public Records Act or other applicable laws. Subject to the California Public Records Act, the Implementing Entity may determine in its sole discretion whether to grant access to any information in the data repository to third parties, including Third Party Participants.

#### **14.4. Other Information**

Within thirty (30) days of receipt of a written request from the Wildlife Agencies, the Implementing Entity will provide any requested, non-confidential, non-proprietary information in its possession or control that is relevant for the purpose of assessing whether the Permittees are in compliance with the terms and conditions of the Permits. The Implementing Entity shall list and briefly describe each document withheld for containing confidential or proprietary information.

### **15. MODIFICATIONS AND AMENDMENTS**

The Parties may from time to time modify or amend the SCVHP, this Agreement, or the Permits, in accordance with this Section and the requirements of the ESA, the NCCPA, NEPA and CEQA.

#### **15.1. Administrative Changes**

The Parties understand that ordinary administration and implementation of the SCVHP will require minor variations in the way certain conservation actions are implemented. Such administrative changes, as described in SCVHP Chapter 10.3.1, will not require modification or amendment of this Agreement, the SCVHP, or the Permits, and will not require the prior approval of the Wildlife Agencies. Administrative changes to the SCVHP that may be approved pursuant to this Section include, but are not limited to, the examples described in SCVHP Chapter 10.3.1.

#### **15.2. Minor Modifications of the SCVHP**

The Implementing Entity may propose minor modifications, defined in SCVHP Chapter 10.3.2, to the SCVHP by providing written notice to all of the other Parties. Such notice will include a statement of the reason for the proposed modification and an analysis of its environmental effects, if any, including any effects on Covered Species. The Wildlife Agencies will each approve or disapprove proposed modifications within sixty (60) days of receipt of such notice or will explain in writing to the Implementing Entity why such approval or disapproval cannot be provided within sixty (60) days and will specify when such approval or disapproval will be provided. Proposed modifications will become effective upon the Wildlife Agencies' written approval. The Wildlife Agencies will not approve minor modifications to the SCVHP if they determine that such modifications would result in adverse effects on Covered Species or natural communities under the SCVHP that are significantly different from those analyzed in the SCVHP or would result in additional Take of Covered Species not analyzed in the SCVHP. If any Wildlife Agency disapproves a proposed modification, it may be proposed as an amendment of that Wildlife Agency's Permit as provided in Section 15.4.

Minor modifications of the SCVHP that may be approved pursuant to this Section include, but are not limited to, the examples of minor modifications described in SCVHP Chapter 10.3.2

### **15.3. Amendment of this Agreement**

This Agreement may be amended only with the written agreement of all Parties; provided, however, that any amendment or portion thereof pertaining to Private Project Participants, implementing ordinances under Agreement Section 7.4.1.3, or any other provision of this Agreement pertaining to the land use or other regulatory decisions of the Cities or County will not require the consent of the Water District or VTA.

### **15.4. Amendment of the SCVHP and the Permits**

The Permittees may substantially revise the SCVHP by obtaining the applicable Wildlife Agency's approval of an amendment, as described in SCVHP Chapter 10.3.3, to one or more of the Permits as provided in this Section and in accordance with all applicable laws and regulations, including but not limited to the ESA, NEPA, NCCPA and CEQA. The Implementing Entity will provide written notice to all of the other Parties of any proposed Permit amendment. Such notice will include a copy of any required application for the proposed amendment, a statement of the reason for the amendment and an analysis of its environmental effects, if any, including any effects on Covered Species. The Wildlife Agency will review and approve or disapprove the proposed Permit amendment in an expeditious manner, commensurate with the level of environmental review appropriate to the magnitude of the proposed amendment. Unless and until CDFG adopts regulations that set forth specific requirements for the amendment of NCCPA take authorizations, for purposes of proposed amendments to the State Permit CDFG will accept an application for a Permit amendment that meets the requirements of this Section and ESA requirements for an application for an amendment of an incidental take permit; provided, however, that CDFG's approval or disapproval of the proposed Permit amendment will be based on the requirements of the NCCPA and CEQA and not on the requirements of the ESA.

Revisions of the SCVHP that would require an amendment of one or more of the Permits include, but are not limited to, the examples described in SCVHP Chapter 10.3.3.

### **15.5. Modification or amendment of SCVHP Deadlines**

The Parties acknowledge that it is possible that, even over the full fifty (50) year term of the Permits, Covered Activities and Authorized Take might not occur to the extent projected in the SCVHP and that SCVHP Fee revenues might therefore fall short of projections. A shortfall of SCVHP Fee revenues under these circumstances could make it difficult or impossible for the Permittees to complete the Reserve System within the term of the Permits. If it appears likely that such a shortfall will make it difficult or impossible for the Implementing Entity and other Permittees to meet all SCVHP land acquisition requirements, and all Reserve System habitat restoration and creation requirements, within the timeframes required under Agreement Section 6.4.1, SCVHP Chapter 5.3.1 and SCVHP Chapter 8.12, the Parties anticipate that the Permittees may propose an amendment to the SCVHP, this Agreement, and the Permits to reduce the Authorized Take and Reserve System land acquisition and habitat restoration and creation requirements or to extend the term of the permits in order to allow full implementation of the SCVHP in accordance with all applicable laws and regulations, including but not limited to the ESA, NEPA, NCCPA and CEQA, as provided in

Agreement Section 15.4, SCVHP Chapter 9.4.4 and SCVHP Chapter 10.3.3. This Agreement does not obligate the Wildlife Agencies to approve any such amendment proposal.

#### **15.6. General Land Use and Regulatory Authority of the County and Cities**

The Parties acknowledge that the adoption and amendment of general plans, specific plans, community plans, zoning ordinances and other land use and regulatory ordinances, and the granting of land use entitlements or other regulatory permits by the County or Cities are matters within the sole discretion of the County or Cities and will not require amendments to the Permits, or the approval of other Parties to this Agreement. However, no such action by the County or Cities will alter or diminish their obligations under the Permits.

### **16. REMEDIES AND ENFORCEMENT**

Each Party will have all of the remedies available in equity (including specific performance and injunctive relief) and at law to enforce the terms of the Permits, and to seek redress for any breach or violation thereof; except that none of the Parties will be liable in damages to any other Party or to any other person or entity for any breach of this Agreement, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising from this Agreement. The Parties acknowledge that the Covered Species are unique and that their loss as species would be irreparable and that therefore injunctive and temporary relief may be appropriate in certain instances involving a breach of this Agreement. Nothing in this Agreement is intended to limit the authority of the Federal and State governments to seek civil or criminal penalties or otherwise fulfill its enforcement responsibilities under the ESA, CESA or other applicable law.

#### **16.1. Suspension of Federal Permit**

USFWS may suspend the Federal Permit, in whole or in part, for cause in accordance with 50 Code of Federal Regulations section 13.27 and other applicable laws and regulations in force at the time of such suspension. Except where USFWS determines that emergency action is necessary to avoid irreparable harm to a Covered Species, it will not suspend the Federal Permit without first (1) attempting to resolve any disagreements regarding the implementation or interpretation of the SCVHP or this Agreement in accordance with Agreement Section 6.6, (2) requesting the Permittees to take appropriate remedial actions, and (3) providing the Permittees with written notice of the facts or conduct which may warrant the suspension and an adequate and reasonable opportunity for the Permittees to demonstrate why suspension is not warranted.

#### **16.2. Reinstatement of Suspended Federal Permit**

In the event USFWS suspends the Federal Permit, in whole or in part, as soon as possible after such suspension, USFWS will meet and confer with the Permittees concerning how the suspension can be ended. Subsequent to the conclusion of any such conference, USFWS will identify reasonable, specific actions, if any, necessary to effectively redress the suspension. In making this determination, USFWS will consider the requirements of the ESA and its regulations, the conservation needs of the Covered Species, the terms of the Federal Permit and any comments or

recommendations received during the meet and confer process. As soon as possible, but not later than thirty (30) days after the conference, USFWS will send the Permittees written notice of any available, reasonable actions necessary to effectively redress the deficiencies giving rise to the suspension. Upon performance or completion, as appropriate, of such actions, USFWS will immediately reinstate the Federal Permit. It is the intent of the Parties that in the event of any total or partial suspension of the Federal Permit, all Parties will act expeditiously and cooperatively to reinstate the Federal Permit.

### **16.3. Suspension of the State Permit**

In the event of any material violation of the State Permit or material breach of this Agreement by the Permittees, CDFG may suspend the State Permit in whole or in part; provided, however, that it will not suspend the State Permit without first (1) attempting to resolve any disagreements regarding the implementation or interpretation of the SCVHP or this Agreement in accordance with Agreement Section 6.6, (2) requesting the Permittees to take appropriate remedial actions when such remedial actions are reasonable and available, and (3) providing the Permittees with written notice of the facts or conduct which may warrant the suspension and an adequate and reasonable opportunity for the Permittees to demonstrate why suspension is not warranted or to take steps necessary to cure the violation or breach.

#### **16.3.1. Failure to Maintain Rough Proportionality**

As provided in Agreement Section 9.4.2, in the event that CDFG has determined that the Permittees have failed to meet the rough proportionality requirement as provided in Agreement Section 9.4, and if the Permittees have failed to cure the default or entered into an agreement to do so within forty-five (45) days of the written notice of such determination, CDFG will suspend the State Permit in whole or in part in accordance with California Fish and Game Code section 2820.

### **16.4. Reinstatement of Suspended State Permit**

In the event CDFG suspends the State Permit, as soon as possible but no later than ten (10) days after such suspension, CDFG will confer with the Permittees concerning how the violation or breach that led to the suspension can be remedied. At the conclusion of any such conference, CDFG will identify reasonable, specific actions necessary to effectively redress the violation or breach. In making this determination, CDFG will consider the requirements of NCCPA, the conservation needs of the Covered Species, the terms of the State Permit and this Agreement and any comments or recommendations received during the meet and confer process. As soon as possible, but not later than thirty (30) days after the conference, CDFG will send the Permittees written notice of the reasonable actions necessary to effectively redress the violation or breach. Upon performance of such actions, CDFG will immediately reinstate the State Permit. It is the intent of the Parties that in the event of any suspension of the State Permit, all Parties will act expeditiously and cooperatively to reinstate the State Permit.

### **16.5. Revocation of Federal Permit**

USFWS agrees that it will revoke or terminate the Federal Permit, in whole or in part, pursuant to 50 Code of Federal Regulations sections 13.28-13.29 and 50 Code of Federal Regulations sections



17.22(b)(8) and 17.32(b)(8) only after completing the meet and confer process set forth in Agreement Section 6.6, unless immediate revocation is necessary to avoid the likelihood of jeopardy to a listed species. USFWS agrees that it will not revoke or terminate the Federal Permit, in whole or in part, to avoid the likelihood of jeopardy to a listed species, without first notifying the Permittees of those measures, if any, that the Permittees may undertake to prevent jeopardy to the listed species and maintain the Federal Permit and giving Permittees a reasonable opportunity to implement such measures.

#### **16.6. Revocation of State Permit**

CDFG may revoke or terminate the State Permit for a material violation of the State Permit or material breach of this Agreement by the Permittees if the CDFG determines in writing that (1) such violation or breach cannot be effectively redressed by other remedies or enforcement action, or (2) revocation or termination is required to avoid jeopardizing the continued existence of a Covered Species and to fulfill a legal obligation of the CDFG under the NCCPA.

CDFG agrees that it will not revoke or terminate the State Permit without first (1) attempting to resolve any disagreements regarding the implementation or interpretation of the SCVHP or this Agreement in accordance with Agreement Section 6.6, (2) requesting that the Permittees take appropriate remedial action, and (3) providing the Permittees with notice in writing of the facts or conduct which warrant the revocation or termination and a reasonable opportunity (not less than forty-five (45) days) to demonstrate or achieve compliance with NCCPA, the State Permit and this Agreement.

However, in the event that CDFG has determined that the Permittees have failed to meet the rough proportionality standard provided in Agreement Section 9.4, and if the Permittees have failed to cure the default or to enter into an agreement to do so within forty-five (45) days of the written notice of such determination, CDFG will suspend or revoke the State Permit in whole or in part in accordance with California Fish and Game Code section 2820.

#### **16.7. Obligations in the Event of Suspension or Revocation**

In the event of revocation or termination of a Permit, or of suspension of a Permit pursuant to Agreement Section 16.8, consistent with the requirements of 50 Code of Federal Regulations sections 17.32(b)(7) and 17.22(b)(7), the Permittees will remain obligated to fulfill any existing and outstanding minimization and mitigation measures and conservation measures required under this Agreement, the SCVHP and the Permit for any Take that occurs prior to such revocation, termination, or suspension, until the applicable Wildlife Agency determines that all Take of Covered Species that occurred under the Permit has been mitigated to the maximum extent practicable in accordance with the SCVHP. Regardless of whether the Permit is terminated, suspended, or revoked, the Permittees acknowledge that lands added to the Reserve System must be protected, managed and monitored in perpetuity.

#### **16.8. Emergency Suspension of Permits to Avoid Jeopardy**

If new circumstances arise in which continued implementation of the Covered Activities would appreciably reduce the likelihood of survival and recovery of a Federal or State Listed Species in the

wild, USFWS or CDFG may suspend its Permit on an emergency basis, in whole or in part, without resorting to the procedures specified in this Section. The period of such emergency suspension will be no longer than ninety (90) days. Before extending the suspension beyond ninety (90) days, USFWS and CDFG will comply with the requirements of Agreement Section 16 pertaining to non-emergency Permit suspensions or revocations. During such 90-day period, USFWS will comply with 50 Code of Federal Regulations section 13.27.

#### **16.9. Force Majeure**

In the event that the Permittees are wholly or partially prevented from performing obligations under this Agreement because of unforeseeable causes beyond the reasonable control of and without the fault or negligence of the Permittees (“**Force Majeure**”), including, but not limited to, acts of God, labor disputes, sudden actions of the elements not identified as Changed Circumstances, or actions of non-participating federal or state agencies or local jurisdictions, the Permittees will be excused from whatever performance is affected by such unforeseeable cause to the extent so affected, and such failure to perform will not be considered a material violation or breach, provided that nothing in this section will be deemed to authorize any Party to violate the ESA, CESA or NCCPA, and provided further that:

- The suspension of performance is of no greater scope and no longer duration than is required by the Force Majeure;
- Within fifteen (15) days after the occurrence of the Force Majeure, affected Permittees will give the Wildlife Agencies written notice describing the particulars of the occurrence;
- Permittees will use their best efforts to remedy their inability to perform (however, this paragraph will not require the settlement of any strike, walk-out, lock-out or other labor dispute on terms which in the sole judgment of the Permittees are contrary to their interest); and
- When Permittees are able to resume performance of their obligations, the affected Permittees will give the Wildlife Agencies written notice to that effect.

#### **16.10. Inspections by Wildlife Agencies**

The Wildlife Agencies may conduct inspections and monitoring of the site of any Covered Activity, and may inspect any data or records required by the Permits, in accordance with applicable law and regulations. The Wildlife Agencies will also have reasonable access to conduct inspections of the Reserve System and lands enrolled under the Neighboring Lands Agreement.

### **17. TERM OF AGREEMENT**

#### **17.1. Effective Date**

This Agreement will be effective on the date after all of the following have occurred:

- Formation of the Implementing Entity;
- execution by all Parties;

- issuance of both of the Permits; and
- adoption of an SCVHP implementing ordinance by each of the Cities and the County.

#### **17.2. Term of the Agreement**

This Agreement will run for a term of fifty (50) years from the Effective Date, unless extended pursuant to Agreement Section 17.4, or unless all of the Permits are permanently terminated pursuant to Agreement Section 16, in which case this Agreement will automatically terminate. This Agreement may also be terminated by mutual written agreement of the Parties.

#### **17.3. Term of the Permits**

The Permits will run for a term of fifty (50) years from the date of issuance on the face of the Permits, unless terminated as provided in this Agreement.

#### **17.4. Extension of the Permits**

Upon agreement of the Parties and in compliance with all applicable laws and regulations in force at the time, the Wildlife Agencies may, with respect to the Permits under their respective jurisdictions, extend the Permits beyond their initial terms. If the Permittees desire to extend the Permits, they will so notify the Wildlife Agencies at least six (6) months before the then-current term is scheduled to expire. Extension of the Permits constitutes extension of this Agreement and the SCVHP for the same amount of time, subject to any modifications agreed to by the Parties at the time of extension.

#### **17.5. Withdrawal by a Permittee**

Upon ninety (90) days written notice to the Wildlife Agencies, the Implementing Entity and all other Permittees, any Permittee except for the Implementing Entity may unilaterally withdraw from this Agreement. As a condition of withdrawal, the Permittee will remain obligated to ensure implementation of all existing and outstanding minimization and mitigation and conservation measures required under the Permits for any Take that the Permittee itself caused and any Take by Private Project Participants for which the Permittee extended Authorized Take coverage prior to withdrawal. If a Permittee withdraws before causing or extending any Authorized Take coverage under the Permits, the Permittee will have no obligation to ensure implementation of any minimization or mitigation measures. Such withdrawal of a Permittee from this Agreement will be deemed to constitute a surrender of the Permittee's Authorized Take coverage under the Permits.

Withdrawal by a Permittee will not diminish or otherwise affect the obligations of the remaining Permittees under this Agreement, the SCVHP, or the Permits. The Permittees acknowledge that if one or more Permittees withdraws from this Agreement and, as a result of the withdrawal, it is no longer feasible or practicable to implement the SCVHP successfully, it may be necessary to modify the SCVHP or to amend the Permits, or both, in response to the withdrawal. However, the withdrawal of a Permittee will not, by itself, be sufficient cause for the Wildlife Agencies to revoke or suspend the Permits or take any other enforcement action.

Within forty-five (45) days after receiving written notice of withdrawal from a Permittee, the Wildlife Agencies, the Implementing Entity and all Permittees will meet to discuss and evaluate whether the SCVHP can be successfully implemented without the participation of the withdrawing

Permittee. Relevant factors in this evaluation include but are not limited to whether, without the participation of the withdrawing Permittee, SCVHP implementation will continue to be adequately funded, whether the Permittees can continue to comply with the stay-ahead requirement, whether all required conservation actions can be implemented, and whether the overall SCVHP Conservation Strategy can be implemented consistent with the SCVHP. Based on this meeting or meetings, and based on any other relevant information provided by the Implementing Entity or the remaining Permittees, the Parties will determine whether it is necessary to modify the SCVHP or amend the Permits, or both, in response to the withdrawal.

Upon ninety (90) days written notice to USFWS and CDFG, the Permittees collectively may withdraw from this Agreement. As a condition of such withdrawal, the Permittees will be obligated to ensure implementation of all existing and outstanding minimization, mitigation, and conservation measures required under the Permits for any Take that occurred prior to such withdrawal, to the maximum extent practicable pursuant to 50 C.F.R. 17.22(b)(7) and 17.32(b)(7) for the Federal Permit, and pursuant to Fish and Game Code sections 2820, 2821 and 2834 for the State Permit, until:

(1) The applicable Wildlife Agencies determine that all Take of Covered Species that occurred under the Permits has been mitigated in accordance with the SCVHP, which determination the Wildlife Agencies will make as soon as reasonably possible. The conservation measures required for Take that occurred prior to withdrawal are the same as the conservation measures required to comply with the rough proportionality requirement, in accordance with Agreement Section 9.4 and SCVHP Chapter 8.6.1, with regard to Take that occurred prior to withdrawal; and

(2) The Wildlife Agencies, the Implementing Entity and all Permittees meet to identify and evaluate activities that could voluntarily be undertaken or continued in support of the SCVHP Conservation Strategy notwithstanding the collective withdrawal.

If the Permittees collectively notify USFWS in writing that they plan to withdraw from this Agreement or to discontinue the Covered Activities, they will surrender: (1) the Federal Permit issued by that agency pursuant to the requirements of 50 Code of Federal Regulations Part 13.26; and (2) the State Permit pursuant to Fish and Game Code section 2835 including but not limited to the assurances or authorization for any Take that has not occurred at the time of withdrawal.

Regardless of withdrawal and surrender of the Permits, the Permittees acknowledge that lands in the Reserve System must be protected, managed and monitored in perpetuity.

## **18. MISCELLANEOUS PROVISIONS**

### **18.1. Calendar Days**

Throughout this Agreement and the SCVHP, the use of the term “day” or “days” means calendar days, unless otherwise specified

## 18.2. Response Times

Except as otherwise set forth herein or as statutorily required by CEQA, NEPA, CESA, ESA, NCCPA or any other laws or regulations, the Wildlife Agencies and the Permittees will use reasonable efforts to respond to written requests from a Party within a forty-five (45) day time period. The Parties acknowledge that the Cities and the County are subject to the Permit Streamlining Act and that nothing in this Agreement will be construed to require them to violate that Act. In addition, the Wildlife Agencies will provide timely review of proposals for Covered Activities to be implemented directly by the Permittees, where such review is required by the Permits.

## 18.3. Notices

The Implementing Entity will maintain a list of individuals responsible for ensuring SCVHP compliance for each of the Parties, along with addresses at which those individuals may be notified ("Notice List"). The Notice List as of the Effective Date is provided below. Each Party will report any changes of names or addresses to the Implementing Entity and the other Parties in writing.

Any notice permitted or required by this Agreement will be in writing, and delivered personally, by overnight mail, or by United States mail, postage prepaid. Notices may be delivered by facsimile or electronic mail, provided they are also delivered by one of the means listed above. Delivery will be to the name and address of the individual responsible for each of the Parties, as stated on the most current Notice List.

Notices will be transmitted so that they are received within deadlines specified in this Agreement, where any such deadlines are specified. Notices delivered personally will be deemed received on the date they are delivered. Notices delivered via overnight delivery will be deemed received on the next business day after deposit with the overnight mail delivery service. Notices delivered via non-certified mail will be deemed received seven (7) days after deposit in the United States mail. Notices delivered by facsimile or other electronic means will be deemed received on the date they are received.

The following Notice List contains the names and notification addresses for the individuals currently responsible for overseeing and coordinating SCVHP compliance:

<b><u>County:</u></b> County Executive County of Santa Clara 70 W. Hedding Street, 11 <sup>th</sup> Floor, East Wing San Jose, CA 95110	<b><u>San Jose:</u></b> City Manager City of San Jose 200 East Santa Clara Street San Jose, CA 95112
<b><u>Gilroy:</u></b> City Administrator City of Gilroy 7351 Rosanna St. Gilroy, CA 95020	<b><u>Morgan Hill:</u></b> City Manager City of Morgan Hill 17575 Peak Avenue Morgan Hill, CA 95037

<b>Water District:</b> Chief Executive Officer Santa Clara Valley Water District 5750 Almaden Expressway San Jose, CA 95118	<b>VTa:</b> General Manager Santa Clara Valley Transportation Authority 3331 N. First Street San Jose, CA 95134
<b>Implementing Entity:</b>	

#### **18.4. Entire Agreement**

This Agreement, together with the SCVHP and the Permits, constitutes the entire agreement among the Parties. This Agreement supersedes any and all other agreements, either oral or in writing, among the Parties with respect to the subject matter hereof and contains all of the covenants and agreements among them with respect to said matters, and each Party acknowledges that no representation, inducement, promise of agreement, oral or otherwise, has been made by any other Party or anyone acting on behalf of any other Party that is not embodied herein.

#### **18.5. Limitations on Remedies**

Notwithstanding any language to the contrary in this Agreement, this Agreement is not intended to create, and shall not be construed to create, any rights or remedies against the Wildlife Agencies for money damages or any other relief, including specific performance, that would result in a violation of the ESA, the NCCPA or any other federal or state law or regulation. No Party to this Agreement shall be liable in damages to any other Party or any other person for any performance or failure to perform any obligation identified in this Agreement

#### **18.6. Defense**

The USFWS and the Permittees acknowledge that the Permittee have a significant and independent interest in maintaining the validity and effectiveness of the SCVHP, this Agreement, and the Permit, and supporting documentation, including documentation under the National Environmental Policy Act and ESA, and that the Permittees' interests may not be adequately protected or represented in the event of a judicial challenge to the Permit unless some or all of the Permittees are able to participate in such litigation. Subject to Agreement Section 18.9 (Availability of Funds), the USFWS will, upon the request of the Permittees, and subject to the responsibilities of the U.S. Department of Justice in the conduct of litigation, use reasonably available resources to provide appropriate support to the Permittees in defending, consistent with the terms of the Federal Permit, lawsuits against the Permittees arising out of the USFWS's approval of the Federal Permit.

Upon request, CDFG will, to the extent authorized by California law, cooperate with the Permittees in defending, consistent with the terms of the SCVHP, lawsuits arising out of the Permittees' adoption of this Agreement and the SCVHP.

#### **18.7. Attorneys' Fees**

If any action at law or equity, including any action for declaratory relief, is brought to enforce or interpret the provisions of this Agreement, each Party to the litigation will bear its own attorneys'

fees and costs, provided that attorneys' fees and costs recoverable against the United States will be governed by applicable federal law.

#### **18.8. Elected Officials Not to Benefit**

No member of, or delegate to, the California State Legislature, the United States Congress, the County Board of Supervisors, the city councils of the respective Cities, or the governing boards of the other Permittees will be entitled to any share or part of this Agreement or to any benefit that may arise from it.

#### **18.9. Availability of Funds**

Implementation of this Agreement and the SCVHP by USFWS is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the United States Treasury. The Parties acknowledge and agree that USFWS will not be required under this Agreement to expend any federal agency's appropriated funds unless and until an authorized official of that agency affirmatively acts to commit to such expenditures as evidenced in writing.

Implementation of this Agreement and the SCVHP by CDFG is subject to the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the Treasury of the State of California. The Parties acknowledge and agree that CDFG will not be required under this Agreement to expend any state appropriated funds unless and until an authorized official of that agency affirmatively acts to commit such expenditure as evidenced in writing.

Implementation of this Agreement and the SCVHP by the Permittees is subject to the availability of their respective appropriated funds, including but not limited to the special purpose revenues dedicated to implement the SCVHP. Nothing in this Agreement will be construed to require the obligation, appropriation, or expenditure of any money without express authorization by the County Board of Supervisors, appropriate City Councils and/or governing boards of the Implementing Entity, Water District, and VTA. Notwithstanding these requirements and limitations, the Permittees are required to fund their respective obligations under the Permits as provided in Agreement Section 13. The Parties acknowledge that if the Permittees fail to provide adequate funding for their respective obligations under the Permits, the Permits may be suspended or revoked as provided in Agreement Section 16.

#### **18.10. Governing Law**

This Agreement will be governed by and construed in accordance with the laws of the United States and the State of California, as applicable.

#### **18.11. Duplicate Originals**

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement will be maintained in the official records of each of the Parties hereto.

#### **18.12. Relationship to the ESA, CESA, NCCPA and Other Authorities**

The terms of this Agreement are consistent with and will be governed by and construed in accordance with the ESA, CESA, NCCPA and other applicable state and federal laws. In particular, nothing in this Agreement is intended to limit the authority of USFWS and CDFG to seek penalties or otherwise fulfill its responsibilities under the ESA, CESA and NCCPA. Moreover, nothing in this Agreement is intended to limit or diminish the legal obligations and responsibilities of USFWS as an agency of the federal government or CDFG as an agency of the State of California.

#### **18.13. No Third Party Beneficiaries**

Without limiting the applicability of rights granted to the public pursuant to the ESA, CESA, NCCPA or other applicable law, this Agreement will not create any right or interest in the public, or any member thereof, as a third party beneficiary thereof, nor will it authorize anyone not a Party to this Agreement to maintain a suit for personal injuries or property damages under the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third party beneficiaries will remain as imposed under existing state and federal law.

#### **18.14. References to Regulations**

Any reference in this Agreement, the SCVHP, or the Permits to any regulation or rule of the Wildlife Agencies will be deemed to be a reference to such regulation or rule in existence at the time an action is taken.

#### **18.15. Applicable Laws**

All activities undertaken pursuant to the Permits must be in compliance with all applicable local, state and federal laws and regulations.

#### **18.16. Severability**

In the event one or more of the provisions contained in this Agreement is held to be invalid, illegal or unenforceable by any court of competent jurisdiction, such portion will be deemed severed from this Agreement and the remaining parts of this Agreement will remain in full force and effect as though such invalid, illegal, or unenforceable portion had never been a part of this Agreement. The Permits are severable such that revocation of one of the Federal or State Permits does not automatically cause revocation of the other. For example, if CDFG revokes the State Permit, it does not automatically cause revocation of the Federal Permit.

#### **18.17. Due Authorization**

Each Party represents and warrants that (1) the execution and delivery of this Agreement has been duly authorized and approved by all requisite action, (2) no other authorization or approval, whether of governmental bodies or otherwise, will be necessary in order to enable it to enter into and comply with the terms of this Agreement, and (3) the person executing this Agreement on behalf of each Party has the authority to bind that Party.



**18.18. Assignment**

Except as otherwise provided herein, the Parties will not assign their rights or obligations under this Agreement, the Permits, or the SCVHP to any other individual or entity.

**18.19. Headings**

Headings are used in this Agreement for convenience only and do not affect or define the Agreement's terms and conditions.

**18.20. Legal Authority of USFWS**

USFWS enters into this Agreement pursuant to the ESA, the Fish and Wildlife Coordination Act, and the Fish and Wildlife Act of 1956. Section 10(a) of the ESA expressly authorizes USFWS to issue permits to allow the incidental Take of species listed as threatened or endangered under the ESA.

**18.21. Legal Authority of CDFG**

CDFG enters into this Agreement pursuant to the NCCPA.

**18.22. No Limitation on the Police Power of the Cities or the County**

Nothing in this Agreement, the SCVHP or Permits limits the exercise of or in any way surrenders the police power of the Cities or the County.

**IN WITNESS WHEREOF, THE PARTIES HERETO** have executed this Implementing Agreement to be in effect as of the Effective Date.

Dated: \_\_\_\_\_, 201\_

UNITED STATES FISH & WILDLIFE SERVICE

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

CALIFORNIA DEPARTMENT OF FISH & GAME

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

SANTA CLARA VALLEY HABITAT  
AGENCY

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

COUNTY OF SANTA CLARA

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

CITY OF SAN JOSE

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

CITY OF GILROY

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

CITY OF MORGAN HILL

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

SANTA CLARA VALLEY WATER DISTRICT

By: \_\_\_\_\_

Dated: \_\_\_\_\_, 201\_

SANTA CLARA VALLEY TRANSPORTATION  
AUTHORITY

By: \_\_\_\_\_



EXHIBIT A  
COVERED SPECIES



**EXHIBIT A**  
**COVERED SPECIES**

Species	Scientific Name	Status <sup>1</sup>	
		State/CNPS	Federal
Invertebrates			
Bay checkerspot butterfly	<i>Euphydryas editha bayensis</i>	–	FT
Amphibians and Reptiles			
California tiger salamander	<i>Ambystoma californiense</i>	ST	FT
California red-legged frog	<i>Rana draytonii</i>	CSC	FT
Foothill yellow-legged frog	<i>Rana boylei</i>	CSC	–
Western pond turtle	<i>Clemmys marmorata</i>	CSC	–
Birds			
Western burrowing owl	<i>Athene cunicularia hypugea</i>	CSC	MBTA
Least Bell’s vireo	<i>Vireo bellii pusillus</i>	SE	FE, MBTA
Tricolored blackbird	<i>Agelaius tricolor</i>	CSC	MBTA
Mammals			
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	ST	FE
Plants			
Tiburon Indian paintbrush	<i>Castilleja affinis</i> ssp. <i>neglecta</i>	ST/1B	FE
Coyote ceanothus	<i>Ceanothus ferrisiae</i>	1B	FE
Mount Hamilton thistle	<i>Cirsium fontinale</i> var. <i>campylon</i>	1B	–
Santa Clara Valley dudleya	<i>Dudleya abramsii</i> ssp. <i>setchellii</i>	1B	FE
Fragrant fritillary	<i>Fritillaria liliacea</i>	1B	–
Loma Prieta hoita	<i>Hoita strobilina</i>	1B	–
Smooth lessingia	<i>Lessingia micradenia</i> var. <i>glabrata</i>	1B	–
Metcalf Canyon jewelflower	<i>Streptanthus albidus</i> ssp. <i>albidus</i>	1B	FE
Most beautiful jewelflower	<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	1B	–

Notes:

<sup>1</sup> Status

**Federal**

FE Federally Endangered.

FT Federally Threatened.

BGPA Bald and Golden Eagle Protection Act.

MBTA Migratory Bird Treaty Act.

SOC Species of Concern (National Marine Fisheries Service only).

**State**

SE State Listed as Endangered.

ST State Listed as Threatened.

SR State Listed as Rare.

SC Candidate.

CSC California Special Concern Species.

FP Fully Protected.

**California Native Plant Society (CNPS)**

1B Rare, Threatened, or Endangered in California and Elsewhere.



EXHIBIT B  
MODEL IMPLEMENTING ORDINANCE





## EXHIBIT B

### MODEL IMPLEMENTING ORDINANCE

ORDINANCE NO. \_\_\_\_\_

**AN ORDINANCE OF THE [NAME OF COUNCIL/BOARD] ADDING [TITLE/CHAPTER #] TO THE [NAME OF ENTITY] CODE ADOPTING BY REFERENCE AND IMPLEMENTING THE SANTA CLARA VALLEY HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN INCLUDING AUTHORITY TO COLLECT THE LOCAL DEVELOPMENT MITIGATION FEES ADOPTED BY THE SANTA CLARA VALLEY HABITAT AGENCY FROM PROJECT APPLICANTS AND REMIT THE FEES TO THE AGENCY FOR FUNDING THE PRESERVATION OF NATURAL ECOSYSTEMS IN ACCORDANCE WITH THE PLAN**

**WHEREAS**, the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (“HCP/NCCP”) has been developed to preserve the ecosystems of the southeastern portion of Santa Clara County, which include the [Name of Entity] (“[City/County]”), the central portion of the Santa Clara Valley, portions of the Santa Cruz Mountains to the west, portions of the Diablo Range to the east, the Coyote watershed and portions of the Pajaro watershed, and a significant portion of the Guadalupe watershed (“Plan Area”) to conserve and prevent further endangerment of the plant and animal species that are dependent upon those ecosystems and to comply with federal and state legal requirements for such preservation; and

**WHEREAS**, the HCP/NCCP was drafted by the County of Santa Clara, the Cities of Gilroy, Morgan Hill, and San Jose, the Santa Clara Valley Water District, and the Santa Clara Valley Transportation Authority (collectively the “Local Partners”) in association with the U.S. Fish and Wildlife Service and the California Department of Fish and Game, and in consultation with stakeholder groups and the general public; and

**WHEREAS**, the County of Santa Clara and the Cities of Gilroy, Morgan Hill, and San Jose formed the Santa Clara Valley Habitat Agency, a joint powers agency (“Implementing Entity”), to implement the HCP/NCCP on behalf of the Local Partners, obtain long-term authorized Take coverage through permits from the U.S. Fish and Wildlife Service and the California Department of Fish and Game for the Local Partners’ own activities, and extend such authorized Take coverage to private project applicants under their jurisdiction; and

**WHEREAS**, the HCP/NCCP was adopted by the [Council/Board] on \_\_\_\_\_, 201\_; and

**WHEREAS**, the purpose and intent of this ordinance is to:

- protect vegetation communities and natural areas within the Plan Area which are known to support threatened, endangered, or key sensitive populations of plant and wildlife species;
- enable the [City/County] to achieve the conservation goals set forth in the HCP/NCCP;
- protect the existing character of the [City/County] and the region through the implementation of a system of reserves which will provide for permanent open space, community edges, and habitat conservation for species covered by the HCP/NCCP;

- preserve the ability of affected property owners to make reasonable use of their land consistent with the requirements of applicable laws, which include but are not limited to the National Environmental Policy Act ("NEPA") (42 U.S.C. §§ 4321-4347), the California Environmental Quality Act ("CEQA") (Public Resources Code § 21000 *et seq.*), the Federal Endangered Species Act ("ESA") (16 U.S.C. §§ 1531-1544), the California Endangered Species Act ("CESA") (Fish & Game Code § 2050 *et seq.*), and the California Natural Community Conservation Planning Act ("NCCPA") (Fish & Game Code §§ 2800-2835);
- insure the collection of the Implementing Entity's local development mitigation fees to assist in the maintenance of biological diversity and the natural ecosystem processes that support this diversity; and
- maintain economic development within the [City/County] by providing a streamlined regulatory process from which development can proceed in an orderly process; and

**WHEREAS**, the [Name of Entity] General Plan, adopted by the [Council/Board] on [Date], ("General Plan") contemplates the adoption of the HCP/NCCP, incorporates the goals of the HCP/NCCP, and includes specific strategies to further the goals of the HCP/NCCP as follows:

[Add list of General Plan consistency findings – see section 2.1 of HCP/NCCP for possible language]

**WHEREAS**, the findings set forth herein are based on the [City's/County's] General Plan, the HCP/NCCP and the studies referenced therein, and the estimated acquisition, management and maintenance costs for such property as set forth in the HCP/NCCP (a copy of the HCP/NCCP is on file in the [City/County] Clerk's office); and

**WHEREAS**, the California Constitution authorizes the [City/County] to enact measures that protect the health, safety, and welfare of its citizens; and

**WHEREAS**, Government Code section 66000 *et seq.* authorizes the Implementing Entity to impose fees and other exactions to provide necessary funding for public facilities required to mitigate the negative effect of new development projects within the Plan Area; and

**WHEREAS**, in accordance with the Implementing Agreement, the Implementing Entity may authorize the [City/County] to collect such fees from project applicants on behalf of the Implementing Entity and remit them to the Implementing Entity; and

**WHEREAS**, on \_\_\_\_\_, 201\_, the [Council/Board] certified the Draft Environmental Impact Report/Environmental Impact Statement for the HCP/NCCP project and made appropriate findings pursuant to CEQA and NEPA under File No. \_\_\_\_\_.

**NOW, THEREFORE, BE IT ORDAINED BY THE [COUNCIL/BOARD] OF THE [NAME OF ENTITY]:**

**SECTION 1.** [Title/Chapter] \_\_\_\_\_ is hereby added to the [Name of Entity] Code to read as follows:

**[TITLE/CHAPTER] \_\_\_\_\_  
HABITAT CONSERVATION PLAN**

**Sections:**

\_\_\_\_\_ **Purpose**

_____	<b>Adoption of Habitat Conservation Plan by Reference</b>
_____	<b>Definitions</b>
_____	<b>Application to Covered Activities</b>
_____	<b>Mitigation Fees</b>
_____	<b>Authorized Take Coverage</b>
_____	<b>Guidelines</b>
_____	<b>Interpretation</b>
_____	<b>Operative Date</b>

**Section \_\_\_\_\_ Purpose.**

The purpose of this [Title/Chapter] is to implement the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (“HCP/NCCP”) and the associated Implementing Agreement and Take Permits in order to provide a regulatory framework for promoting the protection and recovery of natural resources, including Covered Species, while streamlining the permitting process for both publicly funded and privately funded planned development in the [Name of Entity]. The HCP/NCCP was developed by the County of Santa Clara, the Cities of Gilroy and Morgan Hill, the Santa Clara Valley Water District, and the Santa Clara Valley Transportation Authority (collectively the “Local Partners”) in association with the U.S. Fish and Wildlife Service and the California Department of Fish and Game, and in consultation with stakeholder groups and the general public.

As a result of the adoption of the HCP/NCCP by the [City/County], the [City/County] (among the other Local Partners) is the recipient of long-term endangered species permits/authorized Take coverage from the U.S. Fish and Wildlife Service and the California Department of Fish and Game for the [City’s/County’s] own activities and, in addition to coverage of its own public projects, the [City/County] will be able to extend authorized Take coverage to private Project Applicants under its jurisdiction.

Rather than separately permitting and mitigating individual projects, the HCP/NCCP evaluates natural resource impacts and mitigation requirements comprehensively in a manner that is more efficient and effective for at-risk species and their essential habitats. This approach will allow the [City/County] to streamline future mitigation requirements into one comprehensive program. The U.S. Fish and Wildlife Service (“USFWS”) the California Department of Fish and Game (“CDFG”) authorized Take coverage also provides assurances that no further commitments of funds, land, or water from covered public and private projects will be required to address impacts on Covered Species beyond that described in the HCP/NCCP to address changed circumstances as long as the HCP/NCCP is properly implemented..

In addition to strengthening local control over land use and species protection, the HCP/NCCP provides a more efficient process for protecting natural resources by creating new habitat reserves that will be larger in scale, more ecologically valuable, and easier to manage than the individual mitigation sites created under the current approach. This more efficient and streamlined approach to obtaining authorized Take coverage for both public and private projects will significantly reduce the time and resources previously required to obtain Take coverage on an individual project-by-project basis. Unless an activity is deemed to be in compliance with the federal and state Endangered Species Acts by the Implementing Entity, as described in Chapter 6.2 of the HCP/NCCP, all covered activities occurring within the Local Plan Area will be subject to applicable conditions and fees described in the HCP/NCCP.

**Section \_\_\_\_\_ Adoption of Habitat Conservation Plan/Natural Communities Conservation Plan by Reference.**

The HCP/NCCP is incorporated by reference as though fully set forth herein. Complete copies of the HCP/NCCP are available for inspection at the Office of the [City/County] Clerk and the [Name of Administering Department].

**Section \_\_\_\_\_ Definitions.**

The definitions set forth in this section shall govern the application and interpretation of this [Title/Chapter]. Words and phrases not defined in this section shall be interpreted so as to give this [Title/Chapter] its most reasonable application.

A. "Building Permit" includes a full structural building permit as well as a partial permit such as a foundation-only permit, grading permit, or any other permit or approval for a project authorizing a ground-disturbing activity for a Covered Activity.

B. "Covered Activity" means any activity defined in Section 2.3 of Chapter 2 of the HCP/NCCP as a covered activity and not otherwise exempted from the requirements of the HCP/NCCP.

C. "Covered Species" means the species, listed and non-listed, whose conservation and management are provided for in the HCP/NCCP and for which incidental Take is authorized by the Wildlife Agencies pursuant to the Take Permits. Covered Species are also listed in Exhibit A to the Implementing Agreement.

D. "Habitat Conservation Plan/Natural Communities Conservation Plan" or "HCP/NCCP" means the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan adopted by the [Council/Board] on \_\_\_\_\_, 201\_, and any amendments thereto.

E. "Implementing Agreement" means that agreement made and entered into by and among the United States Fish and Wildlife Service ("USFWS") of the United States Department of the Interior, the California Department of Fish and Game ("CDFG") of the State of California Natural Resources Agency, the Santa Clara Valley Habitat Agency (the "Implementing Entity"), the County of Santa Clara ("County"), the City of San Jose ("San Jose"), the City of Gilroy ("Gilroy"), the City of Morgan Hill ("Morgan Hill"), the Santa Clara Valley Water District ("Water District"), and the Santa Clara Valley Transportation Authority ("VTA") that defines the parties' respective roles and responsibilities and provides a common understanding of actions that will be undertaken to implement the HCP/NCCP.

F. "Implementing Entity" means the Santa Clara Valley Habitat Agency formed on \_\_\_\_\_, 201\_, by and among the County of Santa Clara and the Cities of Gilroy, Morgan Hill, and San Jose pursuant to the Joint Powers Act, Gov. Code § 6500 et seq.

G. "Local Plan Area" means that portion of the geographic study area defined in the HCP/NCCP that lies within the [corporate boundaries/unincorporated area] of the [Name of Entity].

H. "Mitigation Fees" or "Fees" means any Habitat Plan fee(s) that applies to Covered Activities in the Local Plan Area as adopted by the Implementing Entity in accordance with Chapter 9 of the HCP/NCCP and the fee studies in support thereof, and any amendments to those fees, unless otherwise exempted from the fee requirements of the HCP/NCCP by the Implementing Entity.

I. "Planning Permit" means any discretionary permit that authorizes a ground disturbing activity for a Covered Activity including, but not limited to, [list each agency's applicable discretionary land use approvals here, such as tentative map, parcel map, conditional use permit, site development permit, planned development permit, or special use permit], or any other discretionary permit, excluding general plan amendments, zoning and rezoning, annexation, specific plans, and area development policies. The term "Planning Permit" also includes any Building Permit where no other Planning Permit is required.

J. "Project Applicant" means any person or entity applying for a Planning Permit for a project authorizing a ground-disturbing activity for a Covered Activity, including any person or entity opting in to the HCP/NCCP pursuant to Chapter 6.2 of the HCP/NCCP.

K. "Take" and "Taking" have the same meaning provided by the Federal Endangered Species Act ("ESA") (16 U.S.C. §§ 1531-1544) and its implementing regulations with regard to

activities subject to the ESA, and also have the same meaning provided in section 86 of the California Fish and Game Code with regard to activities subject to the California Endangered Species Act ("CESA") (Fish & Game Code § 2050 *et seq.*), and the California Natural Community Conservation Planning Act ("NCCPA") (Fish & Game Code §§ 2800-2835).

L. "Take Permits" means the federal incidental Take permit issued by USFWS to the Implementing Entity, the County, San Jose, Gilroy, Morgan Hill, the Water District, and VTA (collectively, "Permittees") based on the HCP/NCCP pursuant to Section 10(a)(1)(B) of the ESA, and the state incidental Take permit issued by CDFG to the Permittees based on the HCP/NCCP pursuant to Section 2835 of the California Fish and Game Code.

#### **Section \_\_\_\_\_ Application to Covered Activities.**

All Project Applicants for Covered Activities within the Local Plan Area shall comply with the conditions on Covered Activities in Chapter 6 of the HCP/NCCP. Each Planning Permit application for a Covered Activity in the Local Plan Area shall include details of the methods and timing in which the project will comply with the HCP/NCCP in the form and manner required by the Director of [Name of Administering Department]. Applicable conditions on Covered Activities from Chapter 6 of the HCP/NCCP as well as other measures required to implement the conservation strategy of the HCP/NCCP shall be included in each Planning Permit approval for a Covered Activity.

#### **Section \_\_\_\_\_ Mitigation Fees.**

A. As a condition of each land use approval for a Covered Activity in the Local Plan Area, the Mitigation Fees shall be paid in full by the private Project Applicant to the [City/County] no later than the date of issuance by the [City/County] of a Building Permit. The Mitigation Fees shall be paid to the Implementing Entity at the time of issuance of the first Building Permit if more than one Building Permit is required for the project.

B. If the Implementing Entity authorizes another manner of compensation in lieu of the Mitigation Fees (such as a land donation in lieu of payment of the Mitigation Fees), the Project Applicant shall provide the [City/County] with written documentation from the Implementing Entity of compliance with such alternative manner of payment and the dollar equivalent amount of such alternative manner of compensation.

C. In the event the [City/County] determines the project subject to the Planning Permit to be exempt from payment of the Mitigation Fees, no Mitigation Fees shall be required for the project.

D. The [City/County] may collect the Mitigation Fees on behalf of the Implementing Entity if authorized to do so by the Implementing Entity.

#### **Section \_\_\_\_\_ Authorized Take Coverage.**

Upon payment in full of the Mitigation Fees and approval of Planning Permits incorporating all applicable HCP/NCCP conditions of approval, the Project Applicant shall receive authorized Take coverage for the Covered Activity in accordance with the terms of the HCP/NCCP, the Implementing Agreement, and the Take Permits.

#### **Section \_\_\_\_\_ Guidelines.**

The [Council/City Manager, in conjunction with the [Director of Planning/Planning, Building and Code Enforcement,]] may adopt guidelines to assist in the implementation and administration of all aspects of this [Title/Chapter].

#### **Section \_\_\_\_\_ Interpretation.**

In the event of a conflict between any term or requirement of this [Title/Chapter], the HCP/NCCP, the Implementing Agreement or the Take Permits, the term or requirement of the Take Permits shall govern.

**Section \_\_\_\_\_ Operative Date.**

This [Title/Chapter] shall be operative upon adoption by the Implementing Entity of the Mitigation Fees and the issuance of the Take Permits by the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

[Include agency-specific adoption language and signature block]

EXHIBIT C  
NEIGHBORING LANDOWNER CERTIFICATE OF INCLUSION





## Exhibit C

### SANTA CLARA VALLEY HABITAT PLAN

#### NEIGHBORING LANDOWNER CERTIFICATE OF INCLUSION

The United States Fish and Wildlife Service and the California Department of Fish and Game have issued Permits pursuant to the federal Endangered Species Act and the California Natural Community Conservation Planning Act (collectively "Permits") authorizing "Take" of certain species in accordance with the terms and conditions of the Permits, the Santa Clara Valley Habitat Plan ("Habitat Plan") and the associated Implementing Agreement. Under the Permits, Section 10.2.7 of the Habitat Plan, and Section 7.4.3 of the Implementing Agreement, certain activities by the party or entity below are authorized to "Take" certain species (California red-legged frog, California tiger salamander, and Western pond turtle), provided all applicable terms and conditions of the Permits, the Habitat Plan, and the Implementing Agreement are met.

As the owner/operator of the property described by Assessor's Parcel Number and gross acres on Exhibit 1 attached thereto and incorporated herein by this reference, you are entitled to the protection of the Permits to Take those species identified in Section 7.4.3 in connection with normal agricultural practices occurring within a one mile of the boundary of Reserve System lands and with the limitations set forth in Section 10.2.7 of the Habitat Plan and Section 7.4.3 of the Implementing Agreement. In the event that the property depicted on Exhibit 1 is used for other purposes without the express consent of the Santa Clara Valley Habitat Agency, Take Authorization under the Permits will automatically cease. Such authorization is provided as described in the Permits, the Habitat Plan, and the Implementing Agreement. By signing this Certificate of Inclusion you signify your election to receive Take Authorization under the Permits in accordance with the terms and conditions thereof. This Certificate of Inclusion does not give state and federal agencies additional regulatory control over the signatory nor require the signatory to provide additional information not called for in the Certificate of Inclusion, but instead ensures compliance with 50 Code of Federal Regulations, section 13.25(d). Coverage under the Permits will become effective upon receipt of the fully-completed and executed Certificate of Inclusion by the Santa Clara Valley Habitat Agency. In the event that the subject property is sold or leased, buyer or lessee must be informed of these provisions and execute a new Certificate of Inclusion.

Owner	Operator
Print Name:	Print Name:
Signature:	Signature:
Address:	Address:
City/State/Zip:	City/State/Zip:
Phone:	Phone:
Date:	Date:

Santa Clara Valley Habitat Agency
By (Print Name:
Signature:
Date:



Appendix C

**Evaluation of Special-Status Species  
for Coverage in the  
Santa Clara Valley HCP/NCCP**



Appendix C

# Evaluation of Special-Status Species for Coverage in the Santa Clara Valley Habitat Plan

Table C-1 lists species recommended for coverage in the Habitat Plan. Table C-2 lists species considered but not recommended as covered species.

## Literature Cited

### Printed References

- California Natural Diversity Database. 2005. Occurrence information. RareFind, Version 3.0.3. Sacramento, CA: California Department of Fish and Game.
- California Natural Diversity Database. 2012. RareFind, Version 3.1.0 (Updated April 2012). Sacramento, CA: California Department of Fish and Game.
- Leidy, R.A., G. Becker, B.N. Harvey. 2005. Historical status of coho salmon in streams of the urbanized San Francisco Estuary, California. *California Fish and Game* 91(4).
- Moyle, P.B. 2002. *Inland fishes of California*. Revised and expanded. Berkeley, CA: University of California Press.
- U.S. Fish and Wildlife Service. 2004. *Draft recovery plan for vernal pool ecosystems of California and Southern Oregon*. Sacramento, CA.

### Personal Communications

- Hillman, Janell. 2005. Botanist, Santa Clara Valley Water District, San José, CA.
- Launer, Alan. 2005. Research Scientist, Center for Conservation Biology, Stanford University, Palo Alto, CA.
- Padley, Doug. 2005. Wildlife Biologist, Santa Clara Valley Water District, San José, CA.



**Table C-1. Species Recommended for Coverage in the Habitat Plan**

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Invertebrates								
Bay checkerspot butterfly <i>Euphydryas editha bayensis</i>	–	FT	Y	Y	Y	Y	Y	Study area contains almost all known populations and habitat of species throughout range.
Amphibians and Reptiles								
California tiger salamander <i>Ambystoma californiense</i>	CSC	FT	Y	Y	Y	Y	Y	Known to occur in multiple locations in study area (CNDDDB 2005).
California red-legged frog <i>Rana aurora draytoni</i>	CSC	FT	Y	Y	Y	Y	Y	Known to occur in multiple locations in study area (CNDDDB 2005).
Foothill yellow-legged frog <i>Rana boylei</i>	CSC	–	Y	Y	Y	Y	Y	Known from study area.
Western pond turtle <i>Clemmys marmorata</i>	CSC	–	Y	Y	Y	Y	Y	Known to occur in study area (CNDDDB 2005); likelihood of listing within the permit term is low to moderate.
Birds								
Western burrowing owl <i>Athene cunicularia hypugea</i>	CSC	MBTA	Y	Y	Y	Y	Y	Known to occur in study area (CNDDDB 2005); could become listed during permit term. Species is protected under MBTA; take of individuals not allowed.
Least Bell’s vireo <i>Vireo bellii pusillus</i>	SE	FE, MBTA	Y	Y	Y	Y	Y	Recent breeding records from Llagas Creek area (CNDDDB 2005). Suitable habitat present on Uvas Creek, on Pajaro River, and around Coyote Reservoir (D. Padley pers. comm.). Species is listed under MBTA but Special Purpose Permit can be acquired for take of individuals.
Tricolored blackbird <i>Agelaius tricolor</i>	CSC	MBTA	Y	Y	Y	Y	Y	Known to breed in region (CNDDDB 2005); high likelihood of occurring in study area. Species is protected under MBTA; take of individuals not allowed.



Table C-1. Continued

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Mammals								
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	ST	FE	Y	Y	Y	Y	Y	Known to occur occasionally at edges of study area (two records from 1975, Aug. 2002 record in Henry Coe State Park; CNDDDB 2005).
Plants								
Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	ST/1B	FE	Y	Y	Y	Y	Y	Two occurrences west of Anderson Reservoir on Coyote Ridge (CNDDDB 2012).
Coyote ceanothus <i>Ceanothus ferrisiae</i>	1B	FE	Y	Y	Y	Y	Y	Study area includes all three known occurrences and habitat of species throughout range (CNDDDB 2012).
Mount Hamilton thistle <i>Cirsium fontinale</i> var. <i>campylon</i>	1B	–	Y	Y	Y	Y	Y	Forty occurrences in study area (CNDDDB 2012; T. Marker, pers. comm.).
Santa Clara Valley dudleya <i>Dudleya abramsii</i> ssp. <i>setchellii</i>	1B	FE	Y	Y	Y	Y	Y	Study area includes all known occurrences (207) and habitat of species throughout range (CNDDDB 2012; T. Marker, pers. comm.).
Fragrant fritillary <i>Fritillaria liliacea</i>	1B	–	Y	Y	Y	Y	Y	Eight occurrences on east side of Santa Clara Valley (CNDDDB 2012).
Loma Prieta hoita <i>Hoita strobilina</i>	1B	–	Y	Y	Y	Y	Y	Fourteen occurrences in study area (CNDDDB 2012).
Smooth lessingia <i>Lessingia micradenia</i> var. <i>glabrata</i>	1B	–	Y	Y	Y	Y	Y	Thirty-nine occurrences in study area (CNDDDB 2012).
Metcalf Canyon jewelflower <i>Streptanthus albidus</i> ssp. <i>albidus</i>	1B	FE	Y	Y	Y	Y	Y	Ten occurrences, mostly in Santa Clara Valley (CNDDDB 2012).
Most beautiful jewelflower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	1B	–	Y	Y	Y	Y	Y	Thirty-nine occurrences in study area (CNDDDB 2012).

**Table C-1. Continued**

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data	Covered Status <sup>c</sup>	
Notes:				<sup>b</sup> <b>Criteria</b>				
<sup>a</sup> <b>Status</b>				<b>Range:</b> The species is known to occur or is likely to occur within the study area, based on credible evidence, or the species is not currently known in the study area but is expected in the study area during the permit term (e.g., through range expansion or reintroduction to historic range).				
<b>State Status</b>				<b>Status:</b> The species is either:				
FP	=	Fully Protected.		<ul style="list-style-type: none"> <li>▪ listed under the federal ESA as threatened or endangered, or proposed for listing;</li> <li>▪ listed under CESA as threatened or endangered or a candidate for such listing, or listed under the Native Plant Protection Act as rare; or</li> <li>▪ expected to be listed under ESA or CESA within the permit term. Potential for listing during the permit term is based on current listing status, consultation with experts and Wildlife Agency staff, evaluation of species population trends and threats, and best professional judgment.</li> </ul>				
SE	=	State listed as endangered.		<b>Impact:</b> The species or its habitat would be adversely affected by covered activities or projects that may result in take of the species.				
ST	=	State listed as threatened.		<b>Data:</b> Sufficient data exist on the species' life history, habitat requirements, and occurrence in the study area to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to levels specified by regulatory standards.				
SR	=	State listed as rare.		Species proposed for coverage in the Plan were limited to those species for which impacts from covered activities were likely, in order to provide take authorization for the highest priority species. However, many other special-status species are expected to benefit from the Plan, as described in Chapter 5.				
CSC	=	California special concern species (July 2005 list).		<sup>c</sup> <b>Recommended Covered Status</b>				
<b>Federal Status</b>				Y= recommended as covered species in the Habitat Plan.				
MBTA	=	Migratory Bird Treaty Act.		N= not recommended for coverage in the Habitat Plan.				
FE	=	Federally endangered.						
FT	=	Federally threatened.						
FC	=	Candidate for federal listing.						
FPT	=	Federally proposed for threatened listing.						
FPD	=	Federally proposed for delisting.						
FD	=	Federally delisted.						
SOC	=	Species of Concern (National Marine Fisheries Service designation).						
<b>California Native Plant Society Ranking</b>								
1A	=	Presumed extinct in California.						
1B	=	Rare or endangered in California and elsewhere.						
2	=	Rare or endangered in California, more common elsewhere.						
3	=	Plants about which more information is needed.						
Sources:								
California Natural Diversity Database (CNDDDB). 2005. RareFind 3, Version 3.0.3. Sacramento, CA: California Department of Fish and Game.								
California Natural Diversity Database (CNDDDB). 2012. RareFind 3, Version 3.1.0 (Updated April 2012). Sacramento, CA: California Department of Fish and Game.								
Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.								



**Table C-2. Species Considered but Not Recommended as Covered Species**

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Invertebrates								
Opler's longhorn moth <i>Adela oplerella</i>	–	–	Y	N	Y	Y	N	Common in serpentine habitats throughout study area; able to persist in very small (~0.1 ha) patches of habitat
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	–	FT	N	Y	N	Y	N	Study area outside of range or current distribution but may occur; no CNDDDB records; no known vernal pool habitat within study area
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	–	FE	N	Y	N	Y	N	No known vernal pool habitat within study area and no records listed in CNDDDB (2005)
San Francisco lacewing <i>Nothochrysa californica</i>	–	–	?	N	?	Y	N	Not expected to become listed during permit term
Unsilvered fritillary <i>Speyeria adiastrae adiastrae</i>	–	–	N	Y	N	N	N	Petition for federal listing was denied. Most viable populations have been extirpated in the study area (A. Launer pers. comm.) and it is unlikely to occur in the study area (Spencer et al. 2006); impact of covered activities uncertain; lack of data on habitat requirements and conservation needs
Callippe silverspot butterfly <i>Speyeria callippe callippe</i>	–	FE	N	Y	N	N	N	Coyote and Uvas/Llagas Watersheds outside of range or current distribution. Some have suggested that <i>S. callippe callippe</i> extends to study area, but local collections to date have been <i>S. c. comstocki</i> (A. Lauer pers. comm.)
Serpentine phalangid <i>Calcina serpentina</i>	–	–	N	N	Y	N	N	Not expected to become listed during permit term. All the other many phalangids (described and undescribed) in the study area are not likely to be listed (A. Launer pers. comm.)
Horn's micro-blind harvestman <i>Microcina horni</i>	–	–	Y	N	N?	N	N	Endemic to Santa Clara County; petitioned for listing in 1990 but rejected due to lack of data; impacts of covered activities uncertain
Jung's micro-blind harvestman <i>Microcina jungi</i>	–	–	Y	N	N?	N	N	Endemic to Santa Clara County; petitioned for listing in 1990 but rejected due to lack of data; impacts of covered activities uncertain
Ricksecker's water scavenger beetle <i>Hydrochara rickseckeri</i>	–	–	N	N	N	N	N	Not expected to become listed during permit term and not found in the study area
Bridges (= Coast Range) shoulderband <i>Helminthoglypta nickliniana bridgesi</i>	–	–	Y	N	Y	Y	N	Not expected to become listed during permit term

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
California linderiella fairy shrimp <i>Linderiella occidentalis</i>	–	–	Y	N	?	Y	N	Not expected to become listed during permit term; study area within known range or current distribution
Curved-foot hygrotus diving beetle <i>Hygrotus curvipes</i>	–	–	N	N	?	Y	N	Not expected to become listed during permit term
San Francisco fork-tailed damselfly <i>Ischnura gemina</i>	–	–	Y	N	?	?	N	Unlikely to become listed during the permit term
California floater (a freshwater mussel) <i>Anodonta californiensis</i>	–	–	Y	N	N?	N	N	Unlikely to become listed over the permit term.
Monarch butterfly <i>Danaus plexippus</i>	–	–	N	N	N	Y	N	Roost sites not known to occur in the study area; not expected to become listed during permit term
Myrtle's silverspot butterfly <i>Speyeria zerene myrtleae</i>	–	FE	N	N	N	N	N	Study area outside of range or current distribution
<b>Fish</b>								
Sacramento perch (within native range) <i>Archoplites interruptus</i>	CSC	–	Y	N	Y	Y	N	Listing unlikely due to current population expansion outside of native range and native habitat type
Monterey roach <i>Lavinia symmetricus subditus</i>	CSC	–	Y	N	Y	Y	N	Abundant in Pajaro River, Llagas Creek, and Pacheco Creek (Spencer et al. 2006); unlikely to become listed during permit term
Central California coho salmon <i>Oncorhynchus kisutch</i>	SE (see note)	FE (see note)	N	Y	N	Y	N	State endangered status applies south of San Francisco Bay; federal status applies to naturally spawning populations in streams between Punta Gorda, Humboldt County and San Lorenzo River, Santa Cruz County. Coho salmon currently do not occur in the study area. A recent study of the historic occurrences of Coho in San Francisco Bay drainages found historic Coho occurrence in the upper Coyote Creek and Guadalupe River drainages as “probable” (Leidy et al. 2005). Given that Santa Clara County was at the southern edge of their range (Moyle 2002), they were likely never common in the south Bay. Recovery in this system is highly unlikely due to the presence of dams below likely spawning and rearing habitat.
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	CSC	FD	N	Y	N	Y	N	Low abundance in South Bay, estuarine river reaches only (outside study area)

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Rainbow trout <i>Oncorhynchus mykiss</i>	–	–	Y	N	N	Y	N	Potential for landlocked populations within study area to become listed is low because Alameda Creek population was removed from listed ESU January 5, 2006
River lamprey <i>Lampetra ayresi</i>	CSC	–	Y?	N	Y	N	N	Not likely to become listed during permit term; biology and distribution not studied in California
Pacific lamprey <i>Lampetra tridentata</i>	–	–	Y	Y	Y	Y	N	Petition for federal listing; recently rejected but may be resubmitted. Section 10 coverage will be obtained for the SCVWD under the Three Creeks HCP. South County coverage to be obtained under amendment or separate permit.
South-Central California Coastal steelhead <i>Oncorhynchus mykiss</i>	CSC	FT	Y	Y	Y	Y	N	Occurs in Pajaro River and tributaries; suitable habitat occurs above Uvas Dam (CNDDDB 2005). Section 10 coverage for the SCVWD to be obtained under amendment or separate permit.
Central California Coastal steelhead <i>Oncorhynchus mykiss</i>	–	FT	Y	Y	Y	Y	N	Occurs in Coyote Creek and tributaries (CNDDDB 2005). Section 10 coverage for the SCVWD will be obtained under the Three Creeks HCP.
Central valley fall-run Chinook salmon <i>Oncorhynchus tshawytscha</i>	CSC	SOC	Y	Y?	Y	Y	N	Occurs in Guadalupe River; species was federal candidate but listing was not warranted per 1999 decision; NOAA considers population in study area to be of hatchery stock and not part of the listed ESU; due to increasing population numbers listing of this species is may be unlikely. Section 10 coverage for the SCVWD will be obtained under the Three Creeks HCP.
<b>Amphibians</b>								
Western spadefoot <i>Spea hammondi</i>	CSC	–	N	N	N	N	N	Recent comprehensive evaluations of survey data and museum specimens have concluded that this species has not historically or does not currently occur in Santa Clara County (see USFWS [2004] for a summary of these studies)
<b>Reptiles</b>								
Alameda whipsnake <i>Masticophis lateralis euryxanthus</i>	ST	FT	N	Y	N	Y	N	Southern edge of subspecies range is at the northern edge of Santa Clara County within SFPUC Alameda Watershed (covered by separate HCP); subspecies may intergrade with chaparral whipsnake (M. l. lateralis) at the southern edge of its range making identification difficult

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Silvery legless lizard <i>Anniella pulchra pulchra</i>	CSC	–	Y	N	Y	N	N	Suitable habitat may occur in the study area; not expected to become listed during permit term
San Joaquin coachwhip <i>Masticophis flagellum ruddocki</i>	CSC	–	N	N	N	Y	N	Not expected to become listed during permit term
California horned lizard <i>Phrynosoma coronatum frontale</i>	CSC	–	Y	N	Y	N	N	Not expected to become listed during permit term; USFWS and CDFG will not cover due to limited data on the species; taxonomy uncertain: recent study combined <i>P. c. frontale</i> and <i>P. c. schmidtii</i> into new species <i>P. blainvillii</i>
<b>Birds</b>								
Western grebe <i>Aechmophorus occidentalis</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
Golden eagle <i>Aquila chrysaetos</i>	FP	BGPA, MBTA	Y	Y	N	Y	N	Take of individuals and nests not allowed; unlikely to be affected by covered activities
Great blue heron (rookery) <i>Ardea herodias</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
California condor <i>Gymnogyps californianus</i>	SE/FP	FE	N	Y	N	Y	N	Species is fully protected; take of individuals not allowed; only known as a rare migrant in study area
Prairie falcon <i>Falco mexicanus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
American peregrine falcon <i>Falco peregrinus anatum</i>	SE/FP	FD	Y	Y	N	Y	N	Species is fully protected; take of individuals not allowed; not likely to be listed under the federal ESA because it was recently removed from the list; removal of limited habitat not expected to rise to the level of habitat take under the state ESA
Bald eagle <i>Haliaeetus leucocephalus</i>	SE/FP	FD, BGPA, MBTA	Y	Y	N?	Y	N	No breeding pairs known to occur in study area, but breeding range may expand; individuals occasionally winter at reservoirs in study area including Calero; species is fully protected but delisted by USFWS; impact of covered activities uncertain
Short-eared owl <i>Asio flammeus</i>	CSC	–	N	Y?	N	Y	N	Not likely to occur in study area due to lack of suitable habitat
Cooper's hawk <i>Accipiter cooperii</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Osprey <i>Pandion haliaetus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Sharp-shinned hawk <i>Accipiter striatus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Northern harrier <i>Circus cyaneus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Ferruginous hawk <i>Buteo regalis</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
California black rail <i>Laterallus jamaicensis coturniculus</i>	ST/FP	–	N	Y	N	Y	N	Study area outside of range or current known distribution; suitable habitat in the study area is very limited and unlikely to support species
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	CSC	FT	N	Y	N	Y	N	No suitable habitat in study area
Mountain plover <i>Charadrius montanus</i>	CSC	FPT	N	Y	N	Y	N	No suitable habitat in study area
Long-billed curlew <i>Numenius americanus</i>	CSC	–	N	N	N	Y	N	Not expected to become listed during permit term
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	–	delisted	Y	N	N?	Y	N	Species in recovery, not expected to become relisted during permit term; rare wintering visitor to study area
Black tern <i>Chlidonias niger</i> (nesting colony)	CSC	–	N	N	N	Y	N	Not expected to become listed during permit term
California least tern <i>Sterna antillarum (albifrons) browni</i> (nesting colony)	SE/FP	FE	N	Y	N	Y	N	No suitable habitat in study area
American white pelican <i>Pelecanus erythrorhynchos</i>	CSC	–	Y	N	N	Y	N	Does not breed in study area; not expected to become listed during permit term
California horned lark <i>Eremophila alpestris actia</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Loggerhead shrike <i>Lanius ludovicianus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term
White-tailed kite <i>Elanus leucurus</i>	FP	–	Y	N	N	Y	N	Species is fully protected; take of individuals not allowed; species relatively common in study area so not likely to be state or federally listed if fully protected designation is withdrawn



Table C-2. Continued

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	ST	–	N	Y	N	Y	N	Not known to occur in the study area recently or historically
Willow flycatcher <i>Empidonax traillii</i> (various ssp.)	SE	FE (only ssp. <i>extimus</i> )	Y	Y	N	Y	N	Study area outside of breeding range of all willow flycatcher subspecies. Only migrant willow flycatchers are found within the study area. Chance for take is remote. The local migrant subspecies ( <i>brewsteri</i> and possibly <i>adastus</i> ) are not likely to be federally listed
Purple martin <i>Progne subis</i>	CSC	MBTA	N	Y	N	Y	N	Unlikely to breed in study area due to presence of European starlings and house sparrows (competitors) (Spencer et al. 2006); migrants occasionally forage in study area; likely to become listed during permit term. Species is protected under MBTA; take of individuals not allowed
Bank swallow <i>Riparia riparia</i>	ST	MBTA	Y	Y	N	Y	N	No records of breeding in the study area; historic breeding record from 1931 (CNDDDB 2005); currently known only as a rare migrant through area (Spencer et al. 2006), but breeds in nearby Salinas Valley. Species is protected under MBTA; take of individuals not allowed
Salt marsh common yellowthroat (= San Francisco yellowthroat) <i>Geothlypis trichas sinuosa</i>	CSC	MBTA	N	Y	N	N	N	Known to breed in Alviso in freshwater and brackish marshes (CNDDDB 2005, D. Padley pers. comm.). Taxonomy of subspecies breeding in study area is uncertain; efficacy of conservation measures within study area is also uncertain (Spencer et al. 2006). Species is protected under MBTA; take of individuals not allowed
Bell's sage sparrow <i>Amphispiza belli belli</i>	CSC	–	Y	N	Y	N	N	Unlikely to be listed during the permit term
<b>Mammals</b>								
Fringed myotis <i>Myotis thysanodes</i>	–	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Pacific Townsend's (=western) big-eared bat <i>Corynorhinus townsendii townsendii</i>	CSC	–	Y	N	N	Y	N	Not expected to become listed during permit term and not likely to be impacted by covered activities
Long-eared myotis <i>Myotis evotis</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Long-legged myotis <i>Myotis volans</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
Yuma myotis <i>Myotis yumanensis</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
Greater western mastiff bat <i>Eumops perotis</i>	CSC	–	Y	N	N	Y	N	Not expected to become listed during permit term
Small footed myotis <i>Myotis ciliolabrum</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
Pallid bat <i>Antrozous pallidus</i>	CSC	–	Y	N	N	Y	N	Not expected to become listed during permit term
Red bat <i>Lasiurus blossevillii</i>	–	–	Y	N	Y	N	N	Unlikely to become listed during permit term; data on distribution and ecology in California insufficient for coverage (see Western Bat Working Group at <a href="http://www.wbwg.org">www.wbwg.org</a> for more information on this and other bats)
Hoary bat <i>Lasiurus cinereus</i>	–	–	?	N	?	Y	N	Unknown if species occurs in study area; one of the most widespread North American bats
Spotted bat <i>Euderma maculatum</i>	CSC	–	?	N	?	N	N	Unlikely to become listed during permit term; data on distribution and ecology insufficient; unknown if species occurs in study area
Berkeley kangaroo rat <i>Dipodomys heermanni berkeleyensis</i>	–	–	N	Y	N	N	N	Subspecies possibly extinct; historic distribution in Contra Costa and Alameda Counties with southernmost record at Calaveras Reservoir (1940); study area outside of historic range
San Francisco dusky-footed woodrat <i>Neotoma fuscipes annectens</i>	CSC	–	Y	N	N	Y	N	Not expected to become listed during permit term; most of study area outside range of subspecies
Mountain lion <i>Felis concolor</i>	–	–	Y	N	N	Y	N	Not expected to become listed during permit term
Ringtail <i>Bassariscus astutus</i>	FP	–	Y	N	N	Y?	N	Species is fully protected; take of individuals not allowed; species relatively common in study area so not likely to be state or federally listed if fully protected designation is withdrawn
American badger <i>Taxidea taxus</i>	CSC	–	Y	N	Y	Y	N	Not expected to become listed during permit term. Range is expanding outside California

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended	
	State/ CNPS	Federal	Range	Status	Impact	Data	Covered Status <sup>c</sup>	Notes
Plants								
Chaparral harebell <i>Campanula exigua</i>	1B	–	Y	Y	N	Y	N	One occurrence in study area (CNDDDB 2012).
Woodland woollythreads <i>Monolopia gracilens</i>	1B	–	Y	N	Y	Y	N	Not expected to become listed during permit term
Big scale balsamroot <i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	1B	–	Y	Y	N	Y	N	Two occurrences in Santa Clara Valley (CNDDDB 2012).
Franciscan onion <i>Allium peninsulare</i> var. <i>franciscanum</i>	1B	–	N	Y	N	Y	N	Outside of known range
Sharsmith’s onion <i>Allium sharsmithiae</i>	1B	–	N	Y	N	Y	N	Outside of known range
Bent-flowered fiddleneck <i>Amsinckia lunaris</i>	1B		N?	Y	N	Y	N	Occurrence in Santa Clara County along Kinkaid Road outside study area; no occurrences known from study area
Santa Cruz Manzanita <i>Arctostaphylos andersonii</i>	1B	–	Y	N	Y	Y	N	Two occurrences in study area (CNDDDB 2005); occurs near summit road near Mt. Madonna County Park. In Santa Cruz County, species often dominates chaparral where it occurs, so unlikely to be listed during permit term.
Kings Mountain Manzanita <i>Arctostaphylos regismontana</i>	1B	–	Y	Y	N	Y	N	One occurrence in study area (CNDDDB 2005)
Alkali milk-vetch <i>Astragalus tener</i> var. <i>tener</i>	1B	–	N	Y	N	Y	N	Outside of known range
San Joaquin saltbush <i>Atriplex joaquiniana</i>	1B	–	Y?	Y	N	Y	N	One historic occurrence at north end of Salinas Valley near County line (CNDDDB 2005)
Santa Cruz Mountains pussypaws <i>Calyptridium parryi</i> var. <i>hesseae</i>	1B	–	N	Y	N	N	N	Only Santa Clara County occurrence not in study area (CNDDDB 2005)
Sharsmith’s harebell <i>Campanula sharsmithiae</i>	1B	–	N	Y	N	Y	N	Outside of known range
Congdon’s tarplant <i>Centromadia parryi</i> ssp. <i>congdonii</i>	1B	–	Y	Y	N	Y	N	One historic occurrence in study area, extirpated (CNDDDB 2005); four other occurrences in the County along SF Bay
San Francisco Bay spineflower <i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	1B	–	N	Y	N	Y	N	Outside of known range

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Lost thistle <i>Cirsium praeteriens</i>	1A	–	N	Y	N	N	N	Outside of known range
San Francisco collinsia <i>Collinsia multicolor</i>	1B	–	Y	Y	Y?	Y	N	One occurrence in Anderson Reservoir basin
Point Reyes bird's-beak <i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	1B	–	N	Y	N	Y	N	Out of known range
Mount Hamilton coreopsis <i>Leptosyne [Coreopsis] hamiltonii</i>	1B	–	Y	Y	N	Y	N	Unlikely to be affected by covered activities
Hospital Canyon larkspur <i>Delphinium californicum</i> ssp. <i>interius</i>	1B	–	N	Y	N	Y	N	Outside of known range
Western leatherwood <i>Dirca occidentalis</i>	1B	–	N	Y	N	Y	N	Outside of known range; one occurrence known from upper Saratoga Creek outside the study area
Brandegee's eriastrum <i>Eriastrum brandegeae</i>	1B	–	N	Y	N	N	N	Outside of known range
Tracy's eriastrum <i>Eriastrum tracyi</i>	SR/1B	–	N	Y	N	N	N	Outside of known range
Tiburon buckwheat <i>Eriogonum luteolum</i> var. <i>caninum</i>	3	–	N	Y	N	N	N	Outside of known range
Ben Lomond buckwheat <i>Eriogonum nudum</i> var. <i>decurrens</i>	1B	–	N	Y	N	Y	N	Outside of known range
Hoover's button-celery <i>Eryngium aristulatum</i> var. <i>hooveri</i>	1B	–	N?	Y	N	Y	N	One historic occurrence at north end of Salinas Valley by County line; known from Soap Lake in Santa Cruz County across county line
Talus fritillary <i>Fritillaria falcata</i>	1B	–	N	Y	N	Y	N	Out of known range
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	1B	–	N	Y	N	Y	N	Out of known range
Legenere <i>Legenere limosa</i>	1B	–	N?	Y	N	Y	N	Only Santa Clara occurrence is outside study area, on Timber Ridge (CNDDDB 2005) at edge of county in stock ponds that function as vernal pools (J. Hillman pers. comm.). 2002 occurrence on Coyote Ridge needs confirmation.

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>			Recommended		Notes
	State/ CNPS	Federal	Range	Status	Impact	Data	Covered Status <sup>c</sup>	
Woolly-headed lessingia <i>Lessingia hololeuca</i>	3	–	Y	N	N	N	N	Historic collection near Gilroy (CNDDDB 2005)
Mount Hamilton lomatium <i>Lomatium observatorium</i>	1B	–	N	Y	N	Y	N	Outside of known range
Arcuate bush mallow <i>Malacothamnus arcuatus</i>	1B	–	N	N	N	Y	N	Species will likely no longer be recognized in the new edition of the Jepson Manual, the definitive flora of California (Slotta 2004, in prep., and pers. comm.)
Hall's bush mallow <i>Malacothamnus hallii</i>	1B	–	Y	Y	Y	N	N	Status of species' taxonomy is in question.
Oregon meconella <i>Meconella oregana</i>	1B	–	Y?	Y?	N	N	N	May occur in remote section of Henry Coe State Park
Mount Diablo cottonweed <i>Micropus amphibolus</i>	3	–	N	Y	N	N	N	Outside of known range
San Antonio Hills monardella <i>Monardella antonina</i> ssp. <i>antonina</i>	3	–	Y	N	N	N	N	Historic collection at Loma Prieta (CNDDDB 2005)
Prostrate navarretia <i>Navarretia prostrata</i>	1B	–	Y	N	N	N	N	Unlikely to be affected by covered activities; Undocumented population of approximately 150 plants recently seen at San Felipe (Soap) Lake at the county line between Santa Clara and San Benito growing along the east bank of Tesquisquita Slough where it empties into the south west side of the lake.
Santa Cruz Mountains beardtongue <i>Penstemon rattanii</i> var. <i>kleei</i>	1B	–	Y?	Y	N	Y	N	Unlikely to be affected by covered activities; historically occurred near Mt. Madonna
Mount Diablo phacelia <i>Phacelia phacelioides</i>	1B	–	N	Y	N	Y	N	Outside of known range
Hooked popcornflower <i>Plagiobothrys uncinatus</i>	1B	–	N	Y	N	Y	N	Outside of known range
Slender-leaved pondweed <i>Potamogeton filiformis</i>	2	–	N	Y	N	Y	N	Outside of known range
Robust monardella <i>Monardella villosa</i> ssp. <i>globosa</i>	1B	–	Y	N	Y	Y	N	Taxonomic status changed during Plan development. Taxa no longer valid and subsumed under more common taxa.

Table C-2. Continued

Species	Status <sup>a</sup>		Criteria <sup>b</sup>				Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Rock sanicle <i>Sanicula saxatilis</i>	SR/1B	–	N	Y	N	Y	N	One occurrence in Henry Coe State Park (CNDDDB 2012); also known from Mt. Hamilton on University of California and private land just outside study area; no impacts expected from covered activities.
Maple-leaved checkerbloom <i>Sidalcea malachroides</i>	1B	–	Y	Y	N	Y	N	One historic occurrence in study area, current status unknown
Rayless ragwort <i>Senecio aphanactis</i>	2	–	N	Y	N	Y	N	Outside of known range
Mount Hamilton jewelflower <i>Streptanthus callistus</i>	1B	–	Y	Y	N	Y	N	Several occurrences in study area in Henry Coe State Park (CNDDDB 2005); will not be affected by covered activities; endemic to Santa Clara County
California seablite <i>Suaeda californica</i>	1B	FE	N	Y	N	Y	N	Outside of known range; suitable habitat is tidal salt marsh
Saline clover <i>Trifolium hydrophilum</i> [ <i>T. depauperatum</i> var. <i>hydrophilum</i> ]	1B	–	N	Y	N	Y	N	Occurs in Soap Lake in San Benito County
Common viburnum <i>Viburnum ellipticum</i>	2	–	Y	N	N?	N	N	Species is fairly common in Pacific Northwest and unlikely to be listed. There is one unverified occurrence on Little Uvas Road in Morgan Hill. No CNDDDB (2006) occurrences within the study area. Species not likely to be adversely affected by covered activities.
California hoptree <i>Ptelea crenulata</i>	–	–	Y	N	N	N	N	Study area encompasses the southern end of this locally rare species' range limit in the Coast Range. Species is highly unlikely to be listed during the permit term and is unlikely to be adversely affected by covered activities. Additionally, very little data exists for this species that would allow an assessment of impacts or creation of conservation measures.
Santa Clara thorn-mint <i>Acanthomintha lanceolata</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.

Table C-2. Continued

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
Serpentine sunflower <i>Helianthus exilis</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Brewer's calandrinia <i>Calandrinia brewer</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Serpentine leptosiphon <i>Leptosiphon ambiguus</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Brewer's clarkia <i>Clarkia breweri</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Large-flowered leptosiphon <i>Leptosiphon grandiflorus</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Santa Clara red ribbons <i>Clarkia concinna</i> ssp. <i>Automixa</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Spring lessingia <i>Lessingia tenuis</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.

Table C-2. Continued

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended Covered Status <sup>c</sup>	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data		
San Francisco wallflower <i>Erysimum franciscanum</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Michael's rein orchid <i>Piperia michaelii</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Stinkbells <i>Fritillaria agrestis</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.
Serpentine bedstraw <i>Galium andrewsii</i> ssp. <i>gatense</i>	4	–	Y	N	N?	N	N	Species does not meet the criteria for status or data: it is unlikely to become listed during the permit term and insufficient data exists at this time to evaluate impacts to or develop conservation measures for this species. Plan Conservation Actions may benefit this species incidentally.



Table C-2. Continued

Species	Status <sup>a</sup>			Criteria <sup>b</sup>			Recommended	Notes
	State/ CNPS	Federal	Range	Status	Impact	Data	Covered Status <sup>c</sup>	
Notes				<sup>b</sup>	<b>Criteria</b>			
a	<b>Status</b>			<b>Range:</b> The species is known to occur or is likely to occur within the Habitat Plan study area, based on credible evidence, or the species is not currently known in the study area but is expected in the study area during the permit term (e.g., through range expansion or reintroduction to historic range).				
	<b>State Status</b>			<b>Status:</b> The species is either:				
	FP	=	Fully Protected.	▪ listed under the federal ESA as threatened or endangered, or proposed for listing;				
	SE	=	State listed as endangered.	▪ listed under CESA as threatened or endangered or a candidate for such listing, or listed under the Native Plant Protection Act as rare; or				
	ST	=	State listed as threatened.	▪ expected to be listed under ESA or CESA within the permit term. Potential for listing during the permit term is based on current listing status, consultation with experts and Wildlife Agency staff, evaluation of species population trends and threats, and best professional judgment.				
	SR	=	State listed as rare.	<b>Impact:</b> The species or its habitat would be adversely affected by covered activities or projects that may result in take of the species.				
	CSC	=	California special concern species (July 2005 list).	<b>Data:</b> Sufficient data exist on the species' life history, habitat requirements, and occurrence in the study area to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to levels specified by regulatory standards.				
	<b>Federal Status</b>			Species proposed for coverage in the Plan were limited to those species for which impacts from covered activities were likely, in order to provide take authorization for the highest priority species. However, many other special-status species are expected to benefit from the Plan, as described in Chapter 5.				
	BGPA	=	Bald Eagle and Golden Eagle Protection Act.	<b>Recommended Covered Status</b>				
	MBTA	=	Migratory Bird Treaty Act.	Y recommended as covered species in the Habitat Plan.				
	FE	=	Federally endangered.	N not recommended for coverage in the Habitat Plan.				
	FT	=	Federally threatened.					
	FC	=	Candidate for federal listing.					
	FPT	=	Federally proposed for threatened listing.					
	FPD	=	Federally proposed for delisting.					
	FD	=	Federally delisted.					
	SOC	=	Species of Concern (National Marine Fisheries Service designation).					
	<b>California Native Plant Society Ranking</b>			<sup>c</sup>				
	1A	=	Presumed extinct in California.					
	1B	=	Rare or endangered in California and elsewhere.					
	2	=	Rare or endangered in California, more common elsewhere.					
	3	=	Plants about which more information is needed.					
	4	=	Plants of limited distribution					

Appendix D

## **Species Accounts**



## Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)

### Legal Status

**State:** None

**Federal:** Threatened (U.S. Fish and Wildlife Service 1987)

**Critical Habitat:** Designated (U.S. Fish and Wildlife Service 2008)

**Recovery Planning:** Recovery plan approved (U.S. Fish and Wildlife Service 1998)



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### General Notes

The Bay checkerspot butterfly is one of the most-studied invertebrate taxa in the world. Starting in 1960, Dr. Paul Ehrlich, his research group at Stanford University, and numerous academic graduates or associates of the Stanford group have studied *Euphydryas* butterflies across western North America. Given its distribution in areas near Stanford, and historic presence on campus, the Bay checkerspot butterfly is the most studied of the *Euphydryas* subspecies. This butterfly has been the subject of many hundreds of articles published in peer-reviewed journals, chapters of academic books, more than a dozen doctoral dissertations and master's theses, and many field projects. Much of the accumulated knowledge, along with many of the key references, can be found in the book *On the Wings of Checkerspots: A Model System for Population Biology* (Ehrlich and Hanski 2004).

### Taxonomy

The Bay checkerspot butterfly is a subspecies of the widespread Edith's checkerspot butterfly (*Euphydryas editha*). This species, a member of the family Nymphalidae, is found across much of western North America, from northern Mexico to southern Canada and from the Pacific coast to Wyoming (White and Singer 1974). Subspecies of Edith's checkerspot butterfly are generally distinguished on the basis of differences in phenotype and primary larval host plant. Phenology tends to be closely associated with larval host plant and local environment and also varies among subspecies (Singer and Parmesan 1993; Singer et al. 1993). Most genetic analyses have supported the traditional groupings of populations into subspecies. Depending on the reference, there are more than 30 accepted subspecies of Edith's checkerspot butterfly, including approximately 12 subspecies from California.

The Bay checkerspot butterfly is distinct from Luesther's checkerspot butterfly (*Euphydryas editha luestherae*), a subspecies that feeds on lousewort (*Pedicularis* sp.) and perennial paintbrushes (*Castilleja* spp.) (Murphy and Ehrlich 1980). Luesther's checkerspot butterfly is often found in chaparral in close proximity to Bay checkerspot butterfly populations. The Bay checkerspot butterfly is very similar in appearance to an unnamed form of *E. editha* that also feeds on plantain (*Plantago* sp.) and annual paintbrushes (*Castilleja* spp.), which is found in areas south of the range of the Bay checkerspot butterfly.

Edith's checkerspot butterfly is occasionally placed within the genus *Occidryas* and it has been suggested that the proper name of the Bay checkerspot butterfly is *E. editha editha*. Neither the generic name *Occidryas* nor the reassignment to *E. editha editha* are presently accepted in the scientific community.

## Distribution

### General

The Bay checkerspot butterfly is known from the southern and eastern portion of the greater San Francisco Bay area. Populations, most of which have been extirpated, were known from San Francisco (Twin Peaks and Mount Davidson), San Mateo County (San Bruno Mountain south to Woodside), Santa Clara County (numerous locations), Alameda County (Oakland hills), and Contra Costa County (Franklin Canyon and Morgan Territory). The subspecies is not known from areas north of San Francisco Bay. To the south, starting in San Benito County, an unnamed form of Edith's checkerspot butterfly replaces the Bay checkerspot butterfly in the area's serpentine grasslands.

Within this limited geographic region, butterfly populations are patchily distributed in serpentine grasslands. It is unclear whether the Bay checkerspot butterfly was more widely distributed within the region prior to the major changes in composition and distribution of plant species associated with the European colonization of the area (Ehrlich and Murphy 1987).

As of 2005, all populations of the Bay checkerspot butterfly on the San Francisco Peninsula were extirpated, including all populations in San Francisco, San Mateo, and northern Santa Clara counties. Bay checkerspot butterflies were reintroduced to Edgewood County Park and Natural Preserve in April 2007. In the East Bay, the Bay checkerspot butterfly has been extirpated from most of its range, but may still exist in Contra Costa County in the general vicinity of Mt. Diablo. Unfortunately, records from Contra Costa County are often confounded by the presence of the relatively common Luesther's checkerspot butterfly. In south-central Santa Clara County, the Bay checkerspot butterfly is still abundant at multiple locations. Most butterflies are found along the ridge that forms the eastern boundary of the Coyote and southern Santa Clara valleys. This ridge consists of extensive serpentine grasslands, and extends from the Silver Creek Hills, through the Edenvale Hills (sometimes called the East Hills or Coyote Hills), to Pigeon Point just north of Anderson Reservoir Dam. There are multiple

populations of the butterfly along this ridge. There are smaller, scattered populations of the butterfly along the eastern foothills south of the Anderson Reservoir dam and along the western foothills of the Coyote Valley.

Factors implicated in these multiple extinctions on the Peninsula and in the East Bay include direct habitat loss through development, habitat degradation due to non-native species (likely exacerbated by nitrogen-containing pollutants), successional changes from grasslands to scrub and chaparral, periods of unfavorable or highly variable weather, and disruption of regional metapopulation dynamics. The detrimental impacts of these factors are more problematic for the butterflies because the extent of the serpentine grasslands of the Peninsula and East Bay is limited.

## Occurrences within the Study Area

The majority of habitat of the Bay checkerspot butterfly and the vast majority of individuals of the subspecies are found in the area covered by this HCP/NCCP.

### Historical

Bay checkerspot butterflies have been studied in central Santa Clara County since the 1960s and extensive work on the butterfly was conducted in the region during the 1980s and 1990s. Populations located in the Silver Creek Hills, Tulare Hill, and near Coyote Reservoir were study sites for many research projects in the 1960s and 1970s. In the 1980s, research on the butterfly shifted to the large concentration of butterflies present in the hills adjacent to the Kirby Canyon Sanitary Landfill.

Population declines and expansions are well documented for this subspecies, and are very common in this region. No extinctions of populations have been conclusively confirmed (a difficult task requiring multiple years of monitoring) in the area, but at various times populations located in the Silver Creek Hills, Tulare Hill, and the serpentine grasslands located near Kalana Avenue have declined to extinction or near-extinction. It is unclear if the records of isolated butterflies from Communication Hill, the hills south of Anderson Reservoir dam, and the hills west of Highland Avenue (San Martin) represent now-extirpated populations or merely transient butterflies.

Additionally, broad expansions and contractions of populations across slope exposures are common. Warm slopes (generally low elevation, and west- or south-facing) in particular often support high densities of butterflies in seasons following years with ample winter and spring rain. In seasons following drought years, few if any butterflies can be found on the warm slopes.

## Recent

As of 2005 Bay checkerspot butterflies were abundant in the multiple populations found along the eastern foothills, from the Silver Creek Hills to Pigeon Point. Several of these populations regularly support more than 250,000 adult butterflies. In areas south of Pigeon Point, Bay checkerspot butterflies are present in the small patches of grassland just west of Coyote Reservoir. On the west side of the Coyote Valley, Bay checkerspot butterflies have been present in the recent past in serpentine grasslands adjacent to Hale Avenue, in areas adjacent to Kalana Avenue, in the southern portions of the Santa Teresa Hills, in the hills near Calero Reservoir, and on Tulare Hill. Survey effort in this part of the study area is uncertain, though it is believed that these sites do not consistently support this species, due to lack of beneficial management. See *Population Trends 1985–2008*, below, for site specific population information.

## Natural History

### Habitat Requirements

At the present time, the Bay checkerspot butterfly reproduces only in serpentine grasslands. These native species-dominated grasslands support the larval host plants, dwarf plantain (*Plantago erecta*) and purple owl's clover (*Castilleja exserta* and/or *Castilleja purpurescens*), at densities that are high enough to sustain butterfly larvae. These host plants are not serpentine-dependent species and are distributed more widely outside of the study area. Within the study area these nutrient-poor serpentine habitats likely allow these host plants to compete with other non-native grassland species that would typically out-compete them. These grasslands also tend to support many additional species that can provide nectar to the adult butterflies.

Topography is an additional factor determining habitat quality and a variety of microclimates are needed for Bay Checkerspot butterflies to persist (Singer and Ehrlich 1979; Fleishman et al. 2000). Relatively cool and moderate microclimates are critical to a butterfly population's ability to survive drought (Weiss and Murphy 1983) while warm slopes appear to be important during wet/cool years (Weiss et al. 1988). Sites lacking cool and moderate slope exposures are unable to continuously support populations of Bay checkerspot butterflies.

Patch size and proximity to other sites supporting butterflies are also factors in determining suitability of particular serpentine grasslands for Bay checkerspot butterfly populations. In general, as patch size drops below several hectares it becomes increasingly unlikely that the grassland can support a viable population. However, given the dispersal capabilities of the butterfly, small patches of serpentine grassland located a few hundred meters from groups of other small

patches can support butterflies. Additionally, many relative small patches of serpentine grassland located within several kilometers of the region's large checkerspot butterfly populations are frequently occupied.

Weather is an important determinant of habitat quality (Dobkin et al. 1987; Hellmann 2002). Growing season rainfall, which delays senescence of larval host plants, is favorable for the butterfly. During periods of favorable weather, Bay checkerspot butterfly populations expand in extent and abundance. During these periods, grasslands generally considered too warm, too small, or too distant can be occupied by the butterfly.

Conversely, during periods in which there is relatively little growing season rainfall, the larval host plants senesce earlier in the year, and larvae in many locations cannot obtain sufficient food. This results in extensive contractions of the large populations as the distribution of butterflies shifts to cooler microclimates (Weiss et al. 1988). Many of the smaller and flatter patches of serpentine grassland tend to lose butterflies during these periods.

**Table 1.** Habitat Associations for the Bay Checkerspot Butterfly

Land Cover Type	Use by the Butterfly	Habitat Designation	Habitat Characteristics	Explanation
Serpentine grassland	Reproduction, growth, feeding—larvae and adult	Primary	Native bunch grasses; high species richness of native forbs; dwarf plantain ( <i>Plantago erecta</i> ); owl's clover ( <i>Castilleja exserta</i> , <i>C. purpurascens</i> )	Dwarf plantain is the primary larval food plant. Two species of owl's clover are utilized as secondary larval food plants when available. Adults feed on nectar from a variety of native forbs, including species of <i>Mullia</i> , <i>Layia</i> , <i>Lomatium</i> , <i>Lasthenia</i> , <i>Linantus</i> , and <i>Allium</i> .

## Life History

Bay checkerspot butterflies are univoltine, and individuals typically have a maximum life span of only slightly longer than one year. During this year, individuals progress through six fairly distinct life history stages: egg, prediapause larva, diapause (larval dormancy), postdiapause larva, pupa, and adult.

Eggs generally are laid in masses of 50 to 200, typically on the base of the larval host plants (Labine 1968; Singer 1972). Egg masses are occasionally laid on other plants or substrate such as rocks or dirt. The primary larval host plant species is the annual dwarf plantain (*Plantago erecta*). Two annual species of owl's-clover (*Castilleja* sp.) and purple owl's-clover (*C. exserta* ssp. *exserta*) are also used as larval host plants (Hickman 1993).

The eggs hatch in approximately 10 days. Egg masses frequently disappear, apparently from predation by invertebrates or possibly vertebrates. Heavy rain or



hail can also cause significant loss of eggs. Desiccation causes egg mortality under laboratory conditions, but it is not clear if this is a significant problem under field conditions.

After hatching, prediapause larvae feed on their host plants for two to six weeks, until either the larvae are large enough to enter and survive diapause (fourth instar) or have depleted the available food supply. Mortality during this phase is thought to be the primary determinant of the following year's population size; if prediapause survival is high, the population size will increase, and if prediapause survival is low, the population size will decrease. Even in "good" years at least 80% of larvae die prior to diapause (Singer 1972; Fleishman et al. 1997) and larvae resulting from egg masses laid in the mid-to late part of the season have very little chance of surviving (Singer and Ehrlich 1979). Most mortality during this stage is due to lack of food. Predation and excessive precipitation can also result in larval mortality (Dobkin et al. 1987).

Food supply can prove inadequate if the larval host plants senesce early relative to the butterfly (White 1974). This is often the case in dry years and for larvae originating from egg masses laid relatively late in the season. Low density of host plants can also lead to local depletion of resources. In general, dwarf plantain is a more consistent host plant, with densities and standing biomass being less variable than the owl's-clover species (which in some years are virtually absent). Dwarf plantain individuals, however, are typically smaller and senesce earlier than individuals of owl's-clover. While there is certainly a limit to how far larvae can disperse, even first instar larvae will easily traverse several meters in search of suitable host plants, and most larvae shift among individual plants several times.

Newly hatched larvae sometimes group together and make small webs around portions of their host plant. Field studies indicate that the proportion of larvae that make webs is variable (Labine 1968).

As the end of the spring growing season approaches, the larval host plants senesce and many of the butterfly larvae enter a period of physiological dormancy known as diapause. Alternately, many larvae die of starvation trying to reach the appropriate size needed to survive diapause or die shortly after entering diapause due to insufficient amounts of stored resources. Larvae spend diapause under rocks, debris, or plant litter, or in cracks and crevices in the soil. Diapause lasts until larval host plants germinate during the onset of the rainy season in late autumn and early winter. Dwarf plantain tends to be the primary early season food source.

Postdiapause larvae spend the next several months feeding and basking in the sun, growing quickly from small fourth instar larvae to 4 cm long seventh instar larvae. Postdiapause larvae can disperse several tens of meters, and frequently do so in search of host plants, appropriate basking areas, or areas sheltered from inclement weather. Development of larvae in warm microclimates (defined primarily by slope, aspect, and elevation) is frequently several weeks ahead of larvae in cool microclimates. These phenological differences are present even

when the distance between the areas of different microclimates is quite small, on the order of ten meters.

After the larvae reach sufficient size and stage, they pupate. In most years, the majority of larvae pupate in February or March. Phenology is extremely weather dependent, and all of the major transitions in the butterfly's life cycle, including pupation, can be shifted several months. Pupae are formed in a loose web, typically at the base of vegetation or rocks. Individuals remain as pupae for three to five weeks, or longer if there are extended periods of cold and rain.

Some mortality occurs during the post-diapause and pupal stages; the magnitude varies from year to year (White 1986). Parasitoids are evident in post-diapause larvae and pupae, and a high percentage of late-developing larvae are typically parasitized. Parasitoids, however, do not appear to be a major factor in determining population size in the Bay checkerspot butterfly (parasitism is a controlling factor for populations of other species of checkerspot butterflies; Moore 1989). In some years a pathogen, which causes the darkening, liquefaction, and death of butterfly larvae, is present. Field studies have observed that pupae frequently disappear, and predation has long been presumed to be the cause. In general, approximately 50% of the late (at least early sixth instar) post-diapause larvae present at a given location will survive to become an adult butterfly.

After several weeks and when the weather warms, butterflies will eclose (emerge from pupae). Newly-emerged individuals crawl to a somewhat exposed location and sun themselves until their wings have fully hardened. Male butterflies tend to emerge earlier in the season than females (Ehrlich 1965), and are on average smaller than females. Individual butterflies survive as adults for seven days to two weeks. How long adult butterflies are present in a given location depends on the number of butterflies (the more butterflies, the more prolonged the adult season), topographic diversity of the site (the more diversity, the more microclimates), and weather (Hellmann et al. 2003). The adult flight season is typically about four to six weeks in length, generally starts in March, and terminates in late April to early May. Actual starting and ending times can vary by several weeks from year to year.

The majority of female butterflies are mated soon after eclosion, occasionally before their wings have hardened fully. There is some hilltopping in the Bay checkerspot butterfly (i.e., congregation for mating at visible landmarks, often hilltops, that may have few larval or adult resources), with males in particular tending to concentrate local ridges (Ehrlich and Wheye 1986). Most female Bay checkerspot butterflies mate only once and are prevented from subsequent mating by a waxy plug deposited by the male (Labine 1964). Females lay multiple egg masses; earlier egg masses contain a greater number of eggs than later egg masses. Nectar is utilized by both male and female butterflies, and is provided by a variety of plant species, including common muilla (*Mullia maritima*), tidytops (*Layia platyglossa*), California goldfields (*Lasthenia californica*), lomatiums (*Lomatium* sp.), onions (*Allium* sp.), and several linanthus species (*Linanthus* sp.).

Rain and hail can cause substantial mortality of adult Bay checkerspot butterflies. Strong wind can also be problematic for the butterflies, often damaging their wings to the point that their ability to fly is compromised. Bay checkerspot butterfly adults are also eaten by a variety of predators. Spiders catch butterflies both in their webs and while the butterflies are not flying (Ehrlich 1965). Other invertebrates undoubtedly prey on some butterflies while the butterflies are on the ground or in the vegetation. Mammals may take some butterflies, particularly during periods when the butterflies are inactive (at night and during periods of bad weather). Birds take Bay checkerspot butterflies, but predation by birds is typically not high (Ehrlich 1965).

Although the Bay checkerspot butterfly is considered an annual univoltine species, it is possible that under some conditions, the butterfly can extend its life cycle for several years. Under laboratory conditions, individual butterflies frequently enter a second diapause (or even three or four diapauses). Given this observed ability, it is very possible that under some circumstances, post-diapause larvae occasionally re-enter diapause, thereby extending their life span from one to two years.

**Table 2.** Generalized Phenology of the Bay Checkerspot Butterfly

Life History Stage	December, January	February	March	April	May	June	July to November
Eggs			✓	✓	✓		
Pre-diapause larvae				✓	✓	✓	
Diapausing larvae	✓				✓	✓	✓
Post-diapause larvae	✓	✓					
Pupae		✓	✓	✓			
Adults			✓	✓			

## Movement

Adult Bay checkerspot butterflies are relatively agile, and can easily fly several kilometers (Harrison 1989). Bay checkerspot butterflies have a general propensity to remain associated with serpentine grasslands, and most movements are within a single patch of serpentine grassland (Ehrlich et al. 1980; Ehrlich and Murphy 1981). Within a given patch, butterflies will frequently fly from one area to another, looking for potential mates, feeding on nectar on scattered groups of flowers, avoiding wind, avoiding other butterflies (mated females in particular tend to avoid males), and looking for oviposition sites. In smaller habitat patches, this means that individual butterflies often fly from one end of the patch to the other. In large habitat patches, those several kilometers in length or width, individual butterflies will generally stay in a portion of the overall site, usually moving much less than a kilometer from the point where they eclosed.

In areas where serpentine grasslands transition into other types of plant communities, Bay checkerspot butterflies will usually turn around and remain in the serpentine grassland (Ehrlich 1965). Butterflies that do not turn around at the edge of their serpentine habitat tend to keep flying—presumably until another patch of habitat is encountered. It is assumed that butterflies may use any land cover type as a movement corridor if the land cover is adjacent to serpentine grassland. Harrison (1989) documented colonization up to 2.8 miles from Coyote Ride, and one individual moved 3.5 miles. Another marked individual was documented to have flown 4.7 miles (U.S. Fish and Wildlife Service 1998). Based on numerous mark-recapture studies, the percentage of individuals that leave particular serpentine grassland areas is thought to be generally low, less than 10%. This percentage apparently increases as the season progresses, and may be higher in populations with very low densities of Bay checkerspot butterflies.

Even with the fairly low percentage of butterflies that leave specific sites, if the butterfly population is large (several of the Bay checkerspot butterfly populations in the HCP/NCCP study area frequently consist of 250,000+ adult butterflies), a large number of Bay checkerspot butterflies will disperse away from their natal habitat patch. For example, if a population includes 250,000 adult butterflies and 1% of the population leaves the site, then 2,500 individual butterflies are expected to leave the site. Given the patchiness of serpentine grasslands and the apparently limited ability of Bay checkerspot butterflies to locate these grasslands from more than a few hundreds of meters distant, most Bay checkerspot butterflies that leave serpentine grasslands do not find other patches of habitat. However, patches of serpentine grassland that are within a few kilometers of moderate to large populations of Bay checkerspot butterflies will receive immigrants on a regular basis; larger patches of serpentine grassland will receive more immigrants, but even very small patches will occasionally be occupied by Bay checkerspot butterflies if the patches are within five to 10 kilometers of the large populations. Conversely, as distance between patches increases, the chance of butterflies migrating between the two patches decreases.

Prediapause larvae generally do not disperse far from where they hatched, but undoubtedly some individuals disperse distances in excess of 10 meters (Launer pers. comm.). Postdiapause larvae are more prone to disperse, but it is unlikely that many move farther than 50 meters from their place of diapause (Launer pers. comm.).

**Table 3.** Movement Distances for Bay Checkerspot Butterfly

Type	Distance	Notes	Sources
Adults—within habitat	Depend on size of habitat patch	Generally stay associated with patch of serpentine grassland	Harrison 1989
Adults—out of habitat	Up to several kilometers	Out of habitat movement tends to be random and linear; ridges are occasionally followed	Harrison 1989
Prediapause	Generally fewer than 10 meters		Harrison 1989
Postdiapause	Generally fewer than 50 meters	Larvae tend to move toward warmer microclimates (often uphill)	Harrison 1989

## Ecological Relationships and Population Dynamics

Regional population dynamics of the Bay checkerspot butterfly tend to be complex. The abundance of individual populations increases or decreases in response to site-specific characteristics (topography, patch size, management regime, etc.) and weather. Likewise, in expansive patches of serpentine grassland, particularly those with considerable topographic diversity, shifts in butterfly density across the landscape are common. Most of these shifts in density across the landscape are expansions and contractions, with the butterfly population shifting from cool and moderate microclimates during dry years, to warmer microclimates during rainy years, and then back to the cool and moderate microclimates during the next drought (Weiss et al. 1988).

Local extinctions of entire populations and of segments of large populations are not uncommon. Reestablishment of populations in areas formerly supporting distinct populations or the spatial expansion of extant populations are also not uncommon. This loose pattern of extinctions, colonizations, contractions, expansions, has led many to characterize the Bay checkerspot butterfly as a series of metapopulations.

The classical concept of a metapopulation (Levins 1969, 1970), a series of ephemeral local populations linked by dispersal, does not apply to the Bay checkerspot butterfly. A better description of the population dynamics of this species is a source-sink metapopulation (Harrison et al. 1988; Hanski 1994). The expansive populations occupying the serpentine grasslands found in the hills along the eastern edge of the Coyote Valley (variously known as the southern Silver Creek Hills, the Edenvale Hills, the East Hills, and the Coyote Hills) are large and microclimatically diverse enough that if properly managed, they may be essentially “extinction proof” (i.e., a perennial “source” population), barring any dramatic shifts in climate, land use, or habitat management. The many smaller and less diverse sites to the west and south are much more susceptible to periods of unfavorable weather, and hence more extinction prone (i.e., “sink” populations). The large populations in the eastern hills are the source of

butterflies, providing butterflies that either supplement the small populations to the west or that actually reestablish populations that have been extirpated.

There have been substantial changes in plant composition and distribution since European colonization. As a result, regional population dynamics of the Bay checkerspot butterfly may be quite different than historically.

The main factor contributing to a butterfly population's decrease or increase is the availability of edible host plants for the prediapause larvae. Host plant availability is determined by two factors, biomass of the host plants and their phenology (relative to the butterflies). Plant biomass in turn is determined by weather, number of viable seeds, seed germination, seedling growth and survival, and land management (e.g., livestock grazing, competition from alien species, etc.). There is considerable annual variation in biomass of the larval host plants. The annual owl's-clover species, in particular, vary greatly spatially and temporally, and are virtually absent in some years.

The second principal factor contributing to availability of larval host plants is phenology (i.e., the timing of development, or more precisely, the relative timing of the butterfly larval development and the developmental timing of their host plants. If many of individual plants do not senesce until mid-May, as is the case when there is at least some precipitation during the early spring growing season, then the butterfly larvae should be able to find sufficient quantities of edible food. If the rains stop early in the growing season, the majority of the plants may senesce early and the majority of the butterfly larvae will have trouble finding enough food to survive.

## Population Status and Trends

**Global:** Declining

**State:** Declining

**Within Study Area:** Declining

## Threats

The Bay checkerspot butterfly is in a precarious situation, but it is not threatened with immediate extinction. There are many threats acting on the butterfly and the serpentine grasslands upon which it depends. These threats include:

**Habitat loss via development.** Many Bay checkerspot butterfly populations have been lost due to conversion of serpentine grasslands to residential, recreational, and commercial development.

**Habitat modification via development.** A number of serpentine grasslands have been partially destroyed by urban and suburban development, either directly (e.g., quarries, dumps, roads) or indirectly by adjacent land use. Water, either irrigation or runoff, from built environments can significantly alter the species

composition of plants on a site, potentially rendering portions of a site unsuitable for Bay checkerspot butterflies.

**Non-native species.** Although serpentine grasslands are typically more resistant to invasion by non-native species than many other vegetation types, non-native species eventually degrade serpentine grasslands. Habitat management is an absolute necessity to control this threat.

**Pollution.** A number of pollutants, especially nitrogen-based pollutants, threaten the Bay checkerspot butterfly. Deposition of nitrogen on serpentine grasslands can radically alter the plant composition. Deposition of nitrogen acts to fertilize the nutrient-poor serpentine soil, and greatly exacerbates the problems caused by non-native species (Weiss 1999).

**Succession.** Given the present species composition, rates and types of disturbance, and pollutants, it appears that areas of serpentine grassland that have been recently disturbed, either by grazing or fire, are better able to support Bay checkerspot butterflies than areas that have not been recently disturbed (Weiss 1999). This probably reflects that grazing and fire tend to reduce the dominance of non-native species. It is not clear what the successional patterns were in prior to European colonization and whether Bay checkerspot butterflies were associated with any particular successional stage.

**Over-collecting/poaching.** Although mentioned by various agencies as being a general threat to rare butterflies, there is no evidence suggesting that the current level of illegal collecting that undoubtedly occurs is of any consequence to Bay checkerspot butterfly persistence. In fact, artificial application of heavy “predation pressure” in the form of intensive collecting was applied to the Jasper Ridge colony in 1964 and 1965, with very little reduction in population size (Ehrlich 1965).

**Overstudy.** Many populations of the Bay checkerspot butterfly have been studied, often quite invasively, since 1960. Several of the most intensely studied populations have gone extinct, most notably those located at Jasper Ridge on Stanford and at Edgewood County Park in San Mateo County. None of the studies designed specifically to examine the potential impacts of research on Bay checkerspot butterfly populations have identified any significant negative impacts (Harrison et al. 1991; Hellmann et al. 2003). Harrison et al. (1991) did indicate that collections may have increased the chances of extinction, with an effect ranging from negligible to a 15% increase in extinction probability over 30 years depending on model assumptions.

**Weather.** Both current weather and potential future changes in weather can impact the Bay checkerspot butterfly. Periods of drought and deluge both have the potential to negatively impact Bay checkerspot butterflies (Singer 1972; Hellmann 2002c). Drought tends to cause Bay checkerspot butterfly populations to retreat to areas with moderate to cool microclimates. If these microclimates are present at a site, then the population merely experiences a contraction in distribution and abundance. If a site does not have sufficient areas of moderate and cool microclimates, then extirpation of the population is a definite

possibility. The impacts of excessively wet years are somewhat more difficult to quantify. Some shifts in microclimatic zone utilized by the butterfly may occur; the very cool microclimates may simply become too wet to successfully sustain butterflies. Other negative impacts of above-average precipitation include increased competition between the native forbs and mostly non-native grasses and, possibly, increased butterfly mortality due to pathogens. Extremes in annual variation of weather may also negatively impact Bay checkerspot butterfly populations.

Predicting future climate changes and the impacts of these changes on biotic systems is a highly inexact science. However, given the sensitivity of butterfly populations to host plant phenology, it is reasonable to assume that future climate change could significantly impact Bay checkerspot butterfly populations (Dennis 1993; Hellmann 2000, 2002).

**Vegetation management.** Both overgrazing and undergrazing have been identified as threats to this species (U.S. Fish and Wildlife Service 2009). Grazing is used to reduce standing biomass of nonnative vegetation and increase the prevalence of native forbs, including Bay checkerspot butterfly's larval host plant. As such, grazing regimes should be monitored to ensure that species habitat is not degraded.

**Gopher control.** It has been observed that Bay checkerspot butterfly's larval host plants stay green and edible longer when located on or near soils recently tilled by gophers. This increases the availability of larval host plants into the dry season and may allow more larvae to reach diapause. Gopher control could decrease the availability of these tilled soils and result in the reduction of larval host plant availability (U.S. Fish and Wildlife Service 2009).

## Data Characterization

The Bay checkerspot butterfly is one of the most studied invertebrate taxon in the world. Starting in 1960, Dr. Paul Ehrlich, his research group at Stanford University, and numerous academic affiliates of the Stanford group have studied *Euphydryas* butterflies across western North America. Given its distribution in areas near Stanford, and indeed the former presence of three populations of the butterfly on campus, the Bay checkerspot butterfly is the most studied of the *Euphydryas* species and subspecies. This butterfly has been the subject of many hundreds of articles published in peer-reviewed journals, multiple chapters of academic books, more than a dozen doctoral and master's dissertations, and many field projects. Much of the accumulated knowledge, along with many of the key references can be found in the book *On the Wings of Checkerspots: A Model System for Population Biology* (Ehrlich and Hanski 2004).



## Population Trends 1985–2008

Long term monitoring sites have been established along Coyote Ridge. Annual estimates of larval population size are the essential component of long-term monitoring of the Bay checkerspot butterfly. The distribution and abundance of the butterfly has been monitored at Kirby Canyon (KC) since 1985, and across most of the core populations since the 1990s. This period included a record 5-year drought (1987–1991), a strong El Nino in 1998, and other wide swings in weather.

This summary includes data for several core areas, and a discussion of broad features of the observed population dynamics that are highly relevant to conservation planning. These features include the range of population fluctuations, synchrony or asynchrony across Coyote Ridge, and responses to exceptional weather events. Also, notable population crashes in response to lack of grazing are also discussed.

## Methods

Larvae are counted in a stratified sampling design developed at Kirby Canyon in the mid-1980s (Murphy and Weiss 1988). The habitat is stratified by March 21 solar radiation (insolation) into 5 “thermal strata;” Very Warm, Warm, Moderate, Cool, and Very Cool. Within each stratum, multiple samples of larval densities are taken over 1,500–3,000 m<sup>2</sup> areas using a timed search technique (10 person-minutes) that can be converted to absolute densities (Weiss 1996). The map of the Kirby Butterfly Trust Leasehold (Figure 3) with Thermal strata and larval sample areas shows the sample sites that have been visited in recent years. 35–40 sites are sampled within the 100 hectare leasehold each year in a window from January through March, the exact dates being weather dependent. The thermal stratification scheme is shown in color—red corresponds to Very Warm, yellow Warm, green Moderate, cyan Cool, and dark blue Very Cool. Larval sample areas are the white polygons.

Larval surveys were extended to most of Coyote Ridge in the 1990s (Weiss 1996). More than 200 sites are visited in a typical year across Coyote Ridge as a whole. Surveys were stratified by “population zones” —habitat blocks 500 or more meters across, corresponding to local topography and grazing regimes (Figure 3). These surveys monitor the health of the overall population on Coyote Ridge, and are a foundation for conservation. These surveys track local and regional population dynamics, and are now supported by a variety of mitigation sources.

## Results

### Population Trends at Kirby Canyon 1985–2008

Since 1985, larval abundance at KC ranged from 25,000 to 800,000 (Figure 4a). From 1985 to 1987, numbers increased from 100,000 to nearly 900,000, followed by a four-year crash down to 30,000. A one year increase in 1992 to 100,000 was followed by several years of relative stability. A sharp decrease in 1997 to 25,000 was followed by a 7-year increase to 500,000+ by 2004, followed by a sharp three year decline to 50,000 by 2007 and 2008.

The 1987–1991 population declines correspond to a multi-year drought, and the particularly sharp decline in 1989 followed a truncated rainy season with a warm March–April. The decline in 1997 followed a record warm, but cloudy/rainy winter. The decline in 2005 followed a warm, dry March–April.

An additional drive of population response was also noted in 2004–2005. On many moderate and cool slopes, larval population densities were high enough ( $>1$  larva/m<sup>2</sup>) in successive years that local defoliation of *Plantago* occurred, and sharp drops to  $<0.05$  larvae/m<sup>2</sup> were observed the following year. The combination of the warm-dry spring 2004 and defoliation exacerbated the population declines.

### Population Dynamics across Coyote Ridge 1992–2008

Larval population estimates in the other population zones show large fluctuations (Figures 4b–4g). The ridgetop areas just north of KC (VTA High 1 and VTA High 2, new names) showed relative stability from 1992 to 1996, sharp declines in 1997, increases through 2004, and subsequent declines through 2007 and 2007. Note that abundance in these areas, especially VTA High1, dropped to near 1000 from peaks of 100,000. These fluctuations were largely synchronous with those at KC.

On the lower slopes of the VTA parcel (VTA low), abundance peaked at 70,000 in 1994, and dropped below detection limits from 1998 to 2000. During this time, some adult butterflies were observed in this area each year, indicating persistence. Larval abundance recovered to 70,000 again by 2003, probably enhanced by immigration from large populations on the ridgetop, and fell to 10,000 by 2006–2008.

Although sampled more intermittently, the data indicate that the southern parts of the UTC property also experienced similar fluctuations. R2A (south of the fence dividing the winter-spring grazing from the spring/summer/fall grazing) peaked in 2003 and 2004, and UTC South (north of the fence) peaked a couple years later in 2006.

Sampling has been even more intermittent in UTC North (numbers not shown) but in 2008, local densities there were among the highest seen on Coyote Ridge.

Areas between UTC South and UTC North have maintained occupancy by Bay checkerspot butterfly, tended to follow the broader trends, but not enough survey sites have been done to estimate total population size.

Larval densities at lower elevations north of the VTA property, including the Los Esteros and Silicon Valley Power 40-acre mitigation parcels, have historically been lower than on the ridgetop. Larval populations in these areas have been estimated to be several hundred to several thousands. In recent years, population trends have tracked the lower slopes of VTA.

The habitat north of Metcalf Canyon (Metcalf, 114 ha included in the population estimate) has historically supported a large population of Bay checkerspot butterflies (Figure 2). Larval numbers increased from 27,000 in 1997 to 200,000 in 2000, to >400,000 in 2001, 800,000 in 2004, and then declined sharply to 83,000 in 2005, and 20,000 in 2007 followed by an increase to 35,000 in 2008.

The adjacent habitat to the northeast (Metcalf North Ridge, or San Felipe) has supported butterflies since 1997, but no quantitative estimates have been made of total numbers.

At the SE end of Coyote Ridge, the serpentine grasslands on Pigeon Point just NW of Anderson Dam has supported moderate to low densities of larvae during intermittent surveys since 1985.

Overall the subpopulations on Coyote Ridge exhibited relative stability from 1992 to 1996, a sharp decline in 1997, increases by an order of magnitude from 1997 through 2004, and subsequent declines by an order of magnitude or more through 2007 and 2008. Fluctuations were largely in synchrony with each other, but asynchronous population responses were noted at some sites in some years. Peak numbers of Bay checkerspot larvae in 2004 across all of Coyote Ridge were on the order of 2,000,000, and the 2008 estimate is on the order of 150,000 larvae.

## Silver Creek Hills

The Environmental Trust of the Ranch at Silver Creek has been responsible for managing the conserved habitat in the Silver Creek Hills. Much of this area was heavily degraded by lack of grazing from 1992 through 1995 (Silver Creek Valley Country Club side) and from 1992 through 2002 on the Ranch at Silver Creek side. Populations are extant in the hundreds. Documentation is provided by Wetland Research Associates who manage the Environmental Trust.

## Tulare Hill

In 2002, there were an estimated 2–3,000 larvae on Tulare Hill, but in 2003 the numbers dropped into the low hundreds, and the population declined to fewer than 100 by 2005. The northern 2/3 of Tulare Hill was ungrazed starting in 2001,

and a rapid invasion of annual grasses eliminated what had once been quality habitat, leading to the. The population is just barely hanging on; in each year from 2006–2008 one individual checkerspot butterfly was observed.

Management activities on the southern parcel Tulare Hill are now being done as mitigation for NO<sub>x</sub> and NH<sub>3</sub> emissions from the Metcalf Energy Center, and have maintained high habitat quality. A Safe Harbor Agreement with The Pacific Gas and Electric Company was developed from 2004 through 2008, and cattle were introduced into the northern 230+ acres that had been ungrazed since 2001. Recovery of hostplant and nectar sources is expected over the next 5–10 years depending on restoration efforts.

### Other Habitat Areas

No systematic surveys of other serpentine patches west of the Coyote Valley were done from 2004 through 2008. It is likely that several of the larger patches (Hale Ave, the Kalana's) support small populations. Butterflies were observed in Rancho Canada del Oro in recent years.

Habitat conditions in the Santa Teresa Hills, especially in the County Park, continue to deteriorate as grass invasions continue in areas with no grazing. No systematic surveys for adult butterflies have been done. Grazed areas in the southeast portions of the Santa Teresa Hills (owned by IBM) continue to support high densities of *Plantago erecta* and nectar sources.

## Existing Conservation Actions in the Study Area

The U.S. Fish and Wildlife Service published a recovery plan for serpentine plants and animals of the San Francisco Bay area in 1998, which includes the Bay checkerspot butterfly. The primary recovery tasks identified for the butterfly are protection of existing habitats, along with their habitat restoration and management, plus population monitoring and further research.

Fifteen units of critical habitat for the bay checkerspot butterfly were designated by the U.S. Fish and Wildlife Service in 2008. The designated critical habitat includes 1,692 acres in San Mateo County and 16,601 acres in Santa Clara County.

At least two HCPs have been approved that provide an incidental take permit for the Bay checkerspot. The San Bruno Mountain HCP, approved in 1982 as the first HCP in the country, includes the bay checkerspot. However, because the butterfly has not been observed on San Bruno Mountain since the mid-1980s, the permit had no provision for incidental take of the butterfly, so no permit was issued for the species. The Bay Checkerspot butterfly may be added as a covered species under an amendment to the San Bruno Mountain HCP, which is currently in development. Two HCP's were prepared by The Pacific Gas and Electric Company for the Metcalf-Edenvale reconductoring project in San José and the

related Metcalf-Hicks/Vasona Line Extension from San José to Los Gatos. The Metcalf-Edenvale HCP had a three year permit term, which expired in 2001. There are at least two other agreements related to HCP's that are currently in development in the Coyote Hills.

Other agreements have led to the establishment of two preserves for the bay checkerspot butterfly. In 1986, USFWS entered into a conservation agreement with Waste Management of California, Inc. and the City of San José to protect 267 acres of habitat for a 15-year period at the Kirby Canyon Landfill in San José (Murphy 1988). In 1991, a housing and golf course project in the Silver Creek Hills of San José resulted in the perpetual protection of a 115-acre conservation area. Since 1991, additional land has also been set aside for numerous projects as mitigation for impacts to Bay checkerspot butterfly, including the Metcalf Energy Center Ecological Preserve on Tulare Hill and their Coyote Ridge parcel (131 acres total), and a parcel acquired by VTA in 2006 on Coyote Ridge for mitigation for recent highway widening projects.

Active research and monitoring on the Bay checkerspot continues by several workers affiliated with Stanford University, other institutions, and consulting firms is ongoing.

## Modeled Habitat Distribution in Study Area

The serpentine habitats where this species reproduces are easily identified in the study area. Due to the extensive research on the population dynamics of this species most of these areas have been surveyed, some quite extensively. Other areas have been surveyed in a more cursory fashion merely to determine whether the species is present or not and to assess the available habitat. The suitable habitat known or expected to occur in the study area is shown in Figure 1. This map was developed using an iterative process of refinement with two experts in Bay checkerspot butterfly biology, Dr. Stuart Weiss and Dr. Alan Launer. Maps were first developed showing patches of serpentine bunchgrass grassland as mapped by the Habitat Plan (see Chapter 3 for a description of the mapping methods). These patches of serpentine grassland, referred to as "habitat units", were further refined in consultation with the experts to delineate populations of Bay checkerspot butterfly based on field research and observations.

Bay checkerspot butterfly habitat units are divided into two broad categories: core and satellite. The definitions for core and satellite habitat units are adapted from the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). Core habitat units are "moderate to large areas of suitable habitat that support persistent bay checkerspot populations." Satellite habitat units are "generally smaller and contain less high-quality habitat than core areas, and may occur some distance from core areas."

The Habitat Plan identified eight core habitat units found within the four "core areas" defined by the Recovery Plan. The Habitat Plan also identified 13 satellite

habitat units. The status of each core and satellite habitat units is classified as “occupied” or “historic/unoccupied”. For habitat units defined as “occupied,” species is known to occupy the patch at least in some years. Where individuals were present historically, but now the site is unoccupied and likely no longer suitable, the habitat unit is defined as “historic/unoccupied”. Additional areas that support serpentine bunchgrass grassland (as mapped by the HCP/NCCP) and are adjacent to known populations or are within the known dispersal distance for the adults in these populations were also delineated as either suitable but “occupancy unknown” or suitable and “potential (no records)” habitat. If the site had not been surveyed thoroughly or surveyed in the last ten years, a habitat unit was classified as “occupancy unknown”. Otherwise suitable patches of serpentine grassland within the dispersal distance of known populations were considered “potential (no records)” habitat units if land use management practices such as livestock grazing could improve conditions for the species. The habitat units are described further and the categories are explained in Table 4.

**Table 4.** Bay Checkerspot Butterfly Habitat Units in the Study Area

Habitat Unit <sup>1</sup> (from North to South)	Status in 2006 <sup>2</sup>	Size (acres)
<i>Target Areas</i>		
UTC	Occupied	1,607
Kirby/East Hills	Occupied	1,334
Pigeon Point	Occupied	117
Silver Creek Hills (Central)	Occupied	208
Metcalf North Ridge <sup>3</sup>	Occupied	518
Metcalf	Occupied	629
Hale/Falcon Crest	Occupied	371
Cañada Garcia	Occupied	180
Kalana Avenue (1–4)	Occupied	110
Tulare Hill	Occupied	336
Santa Teresa Hills (Main)	Occupied	936
Santa Teresa Hills (North)	Potential (no records)	190
Coyote-Bear Ranch County Park	Occupied	60
Calero	Occupied	359
Subtotal Target Areas		6,955
<i>Non-Target Areas</i>		
Silver Creek Hills North #1	Occupied	382
Silver Creek Hills North #2	Potential (no records)	406
Pound Site	Occupied	216
Communications Hill 1	Historic/Unoccupied	230
Communications Hill 2	Historic/Unoccupied	25
San Martin/Hayes Valley	Occupancy Unknown	201
Southwest Anderson Reservoir	Occupancy Unknown	189
Valley Christian High School	Historic/Unoccupied	15
Subtotal Non-Target Areas		1,665
<b>Grand Total</b>		<b>8,621</b>

## Notes:

<sup>1</sup> Habitat Unit names are based on labels used by researchers at Stanford University for long-term monitoring and ecological studies. Also see Figure 1.

<sup>2</sup> Historic/Unoccupied = Site formally occupied but now extirpated and no longer suitable; Occupied = Site remains suitable and Bay checkerspot butterflies observed in at least a portion of the site in some years (not occupied every year); Potential (no records) = Site contains habitat that could be made suitable with proper management (currently unoccupied); Occupancy Unknown = Site status unknown due to lack of field surveys.

<sup>3</sup> Metcalf North Ridge is also referred to as “San Felipe”

Sources: ICF Land Cover Maps, Stanford University Center for Conservation Biology Population Data (through 2006), and personal communications with S. Weiss and A. Launer (2006–2007).

## Literature Cited

### Printed References

- Dennis, R.L.H. 1993. *Butterflies and climate change*. Manchester University Press, New York.
- Dobkin, D.S., I. Olivieri, and P.R. Ehrlich. 1987. Rainfall and the interaction of microclimate with larval resources in the population dynamics of checkerspot butterflies (*Euphydryas editha*) inhabiting serpentine grassland. *Oecologia* 71: 161–166.
- Ehrlich, P.R. 1965. The population biology of the butterfly *Euphydryas editha*. II. The structure of the Jasper Ridge colony. *Evolution* 19: 327–336.
- Ehrlich, P.R., and Ilkka Hanski. (eds.). 2004. *On the wings of checkerspots: a model for population biology*. Oxford University Press. New York.
- Ehrlich, P.R., and D.D. Murphy. 1981. The population biology of checkerspot butterflies (*Euphydryas*). *Biologisches Zentralblatt* 100: 612–629.
- Ehrlich, P.R., and D.D. Murphy. 1987. Conservation lessons from long-term studies of checkerspot butterflies. *Conservation Biology* 1: 122–131.
- Ehrlich, P.R., and D.D. Murphy, M.C. Singer, and C.B. Sherwood. 1980. Extinction, reduction, stability and increase: The responses of checkerspot butterfly (*Euphydryas*) populations to the California drought. *Oecologia* 46: 101–105.
- Ehrlich, P.R., and D. Wheye. 1986. “Nonadaptive” hilltopping behavior in male checkerspot butterflies (*Euphydryas editha*). *The American Naturalist* 132: 477–483.
- Fleishman, E., A.E. Launer, S.B. Weiss, D.D. Murphy, J.M. Reed, and P.R. Ehrlich. 2000. Effects of microclimate and oviposition timing on prediapause larval survival of the Bay checkerspot butterfly, *Euphydryas editha bayensis*. *Journal of Research on the Lepidoptera* 36: 31–44.
- Hanski, I. 1994. A practical model of metapopulation dynamics. *Journal of Animal Ecology* 63: 151–162.
- Harrison, S. 1989. Long-distance dispersal and colonization in the Bay checkerspot butterfly, *Euphydryas editha bayensis*. *Ecology* 70: 1236–1243.
- Harrison, S., D.D. Murphy, and P.R. Ehrlich. 1988. Distribution of the bay checkerspot butterfly, *Euphydryas editha bayensis*: Evidence for a metapopulation model. *The American Naturalist* 132: 360–382.



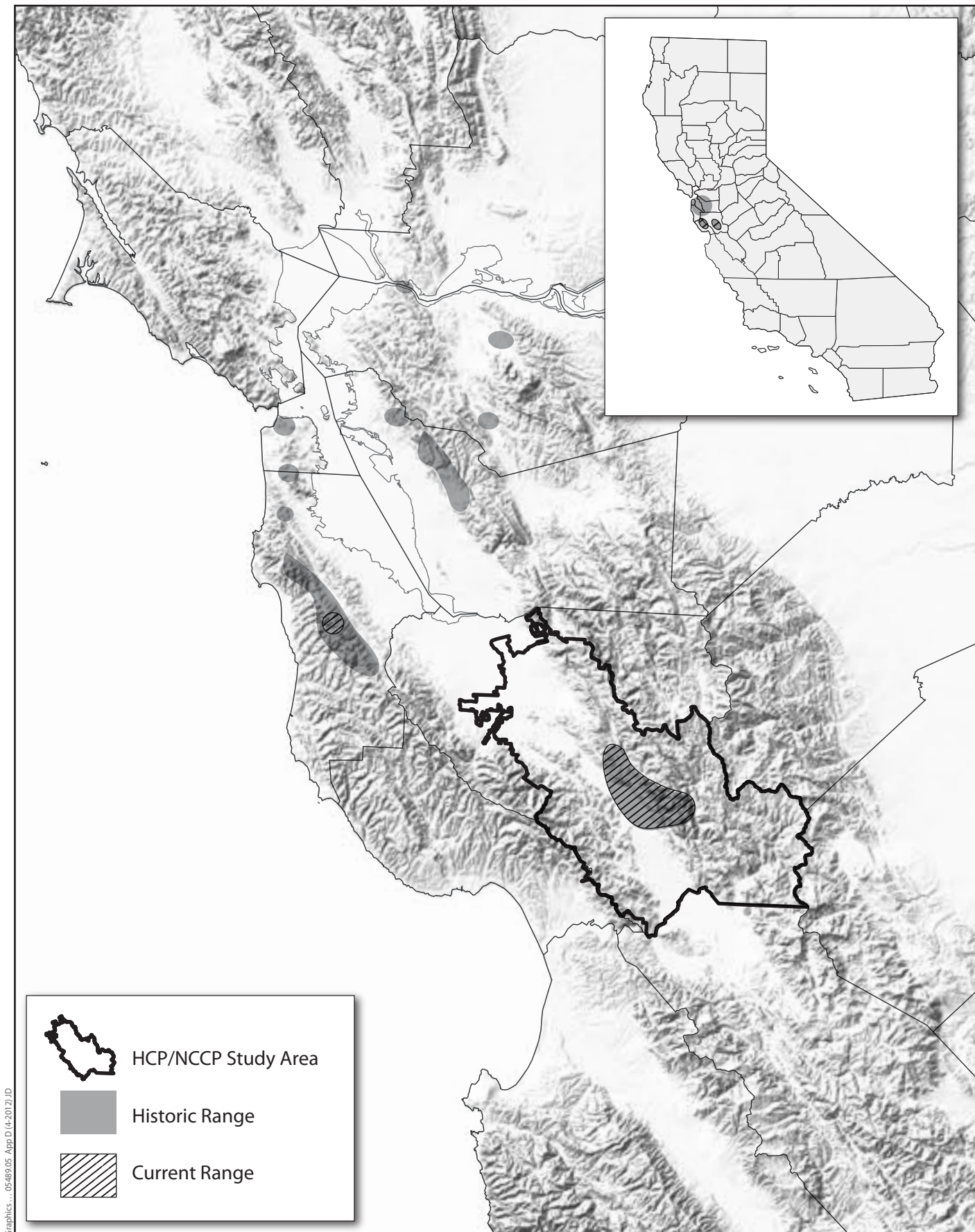
- Harrison, S., J.F. Quinn, J.F. Baughman, D.D. Murphy, et al. 1991. Estimating the effects of scientific study on two butterfly populations. *The American Naturalist* 137: 227–243.
- Hellmann, J.J. 2000. The role of environmental variation in the dynamics of an insect-plant interaction. PhD dissertation, Department of Biological Sciences, Stanford University, Stanford, CA.
- Hellmann, J.J. 2002. The effect of an environmental change on mobile butterfly larvae and the nutritional quality of their hosts. *Journal of Animal Ecology* 70: 925–936.
- Hellmann, J.J., S.B. Weiss, J.F. McLaughlin, C.L. Boggs, P.R. Ehrlich, A.E. Launer, and D.D. Murphy. 2003. Testing short-term hypotheses with a long-term study of a butterfly population. *Ecological Entomology* 28: 74–84.
- Hickman, J.C. (ed.) 1993. *The Jepson Manual of Higher Plants in California*. University of Berkeley Press, Berkeley, CA.
- Labine, P.A. 1964. Population biology of the butterfly, *Euphydryas editha*. I. Barriers to multiple inseminations. *Evolution* 18: 335–336.
- Labine, P.A. 1968. The population biology of the butterfly, *Euphydryas editha*. VIII. Oviposition and its relation to patterns of oviposition in other butterflies. *Evolution* 22: 799–805.
- Levins, R. 1969. Some demographic and genetic consequences of environmental heterogeneity for biological control. *Bulletin of the Entomological Society of America* 15: 237–240.
- Levins, R. 1970. Extinction. Pages 77–107 in M. Gerstenhaber, ed. *Some Mathematical Problems in Biology*. American Mathematical Society, Providence, RI.
- Murphy, D.D. 1988. The Kirby Canyon conservation agreement: a model for resolution of land-use conflicts involving threatened invertebrates. *Environmental Conservation* 15:45-48.
- Murphy, D.D., and P.R. Ehrlich. 1989. Conservation biology of California's remnant native grasslands. Pages 201–211 in L.F. Huenneke and H. Mooney, eds. *Grassland Structure and Function: California Annual Grassland*. Kluwer Academic, Dordrecht.
- Singer, M.C. 1972. Complex components of habitat suitability within a butterfly colony. *Science* 176: 75–77.
- Singer, M.C., and P.R. Ehrlich. 1979. Population dynamics of the checkerspot butterfly *Euphydryas editha*. *Fortschritte der Zoologie* 25: 53–60.

- Singer, M.C., and C. Parmesan. 1993. Sources of variation in patterns of plant-insect association. *Nature* 361: 251–253.
- Singer, M.C., C.D. Thomas, and C. Parmesan. 1993. Rapid human-induced evolution of insect diet. *Nature* 366: 681–683.
- U.S. Fish & Wildlife Service. 1987. Endangered and threatened wildlife and plants; determination of threatened status and critical habitat for the Bay Checkerspot butterfly (*Euphydryas editha bayensis*). Federal Register 52:35366–35378.
- U.S. Fish & Wildlife Service. 1998. Recovery plan for serpentine soil species of the San Francisco Bay area. Portland, OR. 330 + pp.
- U.S. Fish and Wildlife Service. 2008. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Bay Checkerspot Butterfly (*Euphydryas editha bayensis*), Final Rule. *Federal Register* 73(176):50406–50452. August 26.
- U.S. Fish and Wildlife Service. 2009. Bay Checkerspot Butterfly (*Euphydryas editha bayensis*), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office, Sacramento, California. 42 pp.
- Weiss, S.B. 1999. Cars, cows, and checkerspot butterflies: Nitrogen deposition and management of nutrient poor grasslands for a threatened species. *Conservation Biology* 13: 1476–1486.
- Weiss, S.B. and D.D. Murphy. 1993. Climatic considerations in reserve design and ecological restoration. Pages 89–107 in D.A. Saunders, R.J. Hobbs, and P.R. Ehrlich, eds. *Nature Conservation 3. Reconstruction of Fragmented Ecosystems*. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Weiss, S.B., D.D. Murphy, and R.R. White. 1988. Sun, slope, and butterflies: Topographic determinants of habitat quality for *Euphydryas editha*. *Ecology* 69: 1486–1496.
- White, R.R. 1974. Food plant defoliation and larval starvation of *Euphydryas editha*. *Oecologia* 14: 307–315.

## Personal Communications

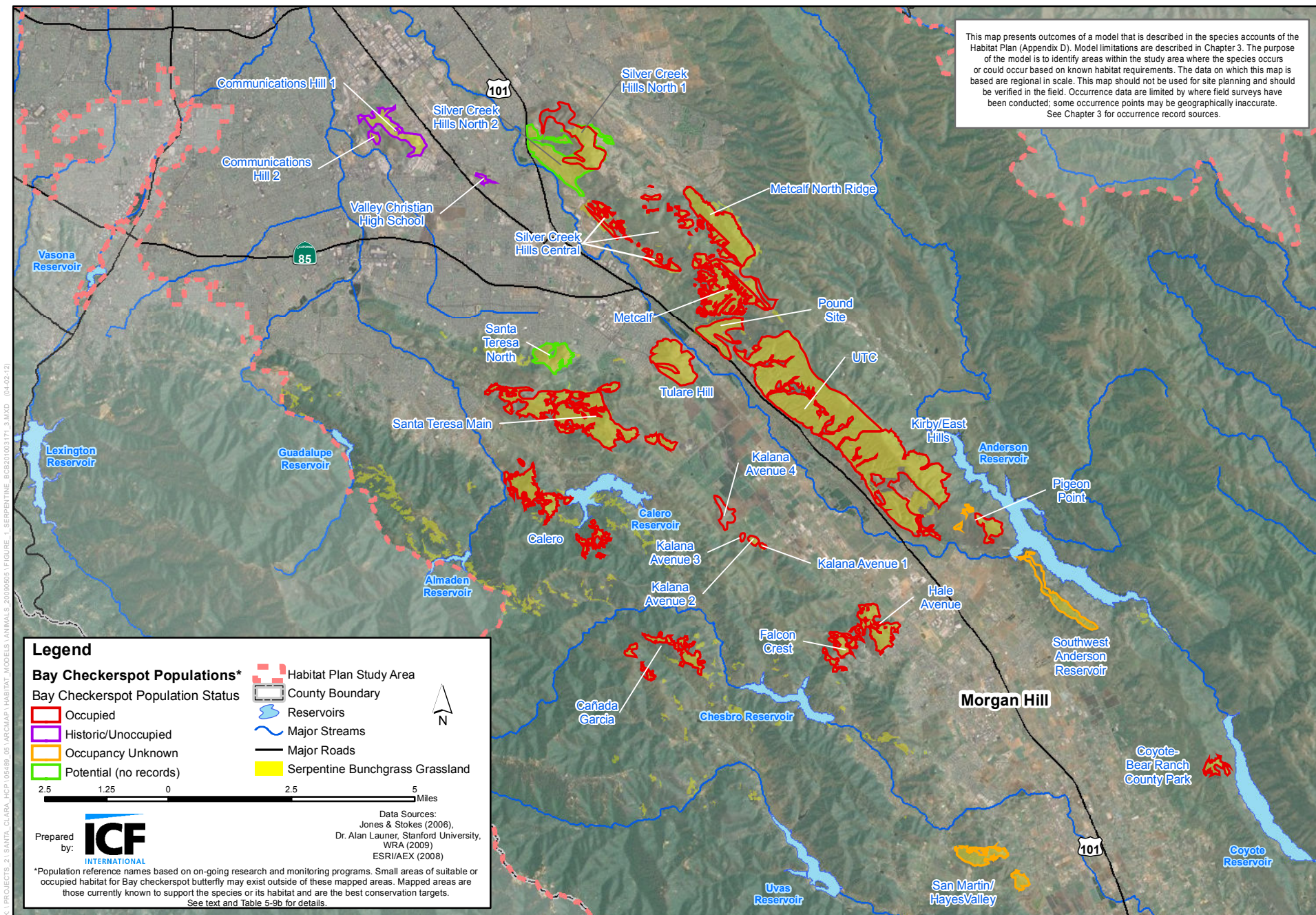
- Launer, Alan. 2006–2007. Research Scientist, Stanford University Center for Conservation Biology, Palo Alto, CA. Various meetings and e-mail correspondence with David Zippin.
- Weiss, Stuart. 2007. Consultant, Creekside Center for Earth Observation, Menlo Park, CA. Meeting with David Zippin, January.





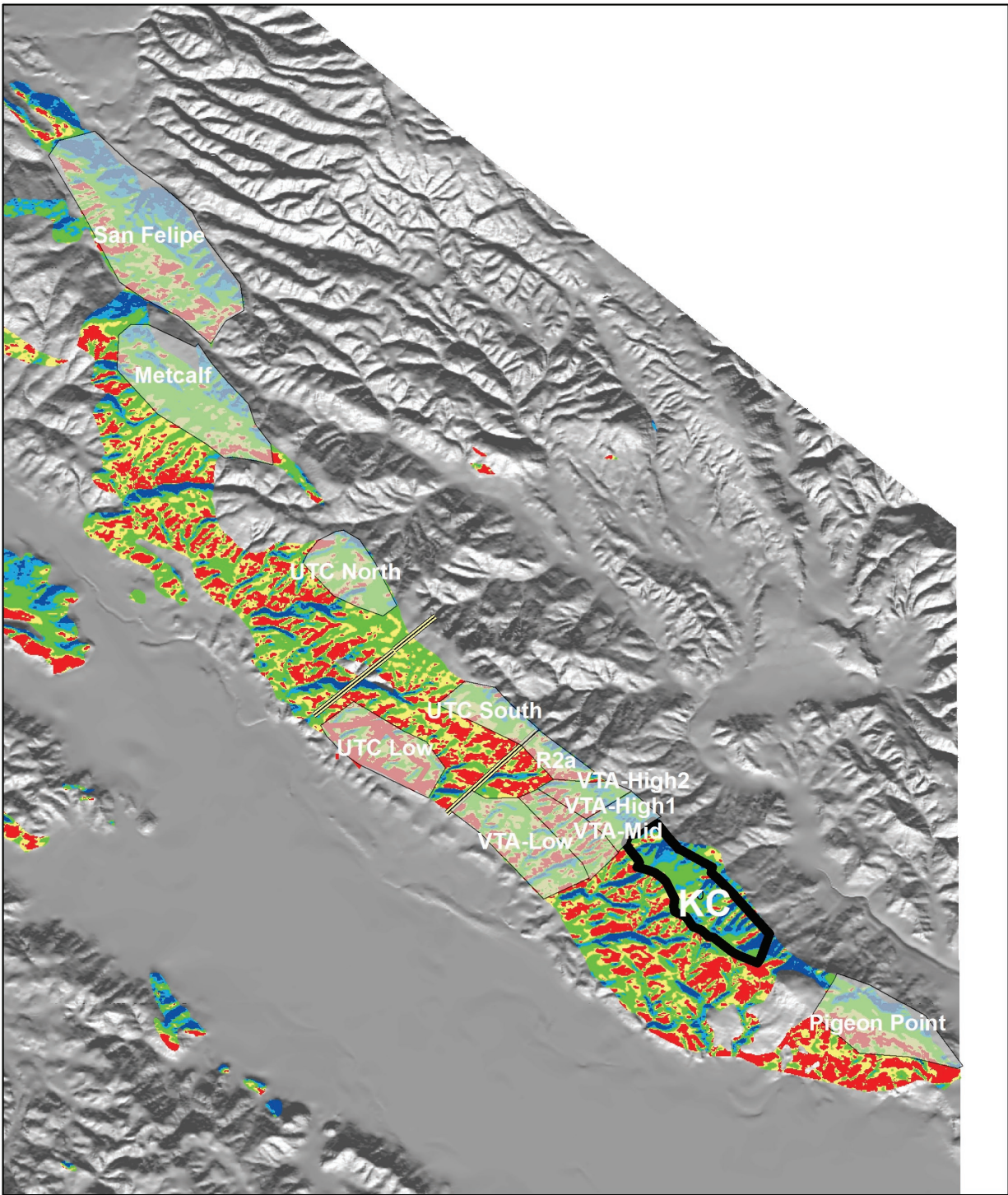
**Figure 1**  
**Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)**  
**Distribution in California**





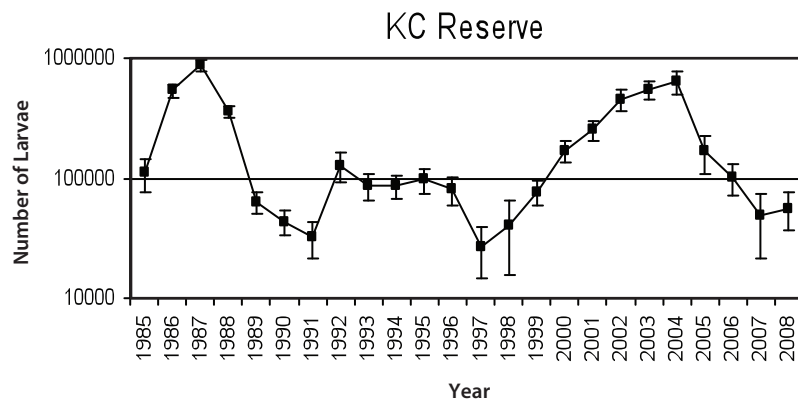
**Figure 2**  
**Bay Checkerspot Butterfly Populations - Santa Clara Valley Habitat Plan**



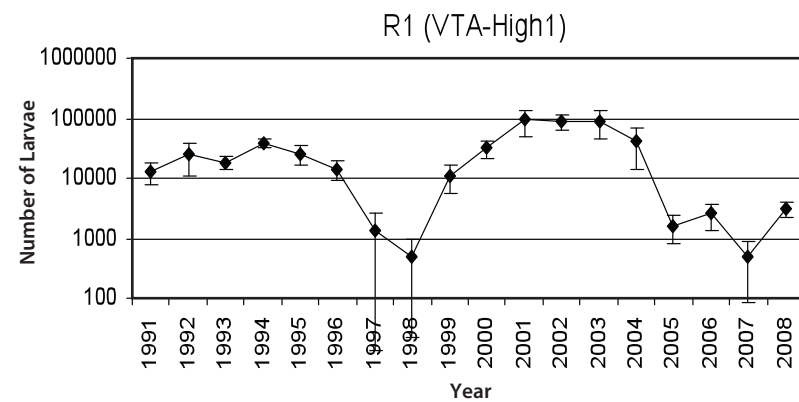


0 0.5 1 2 3 4 Kilometers

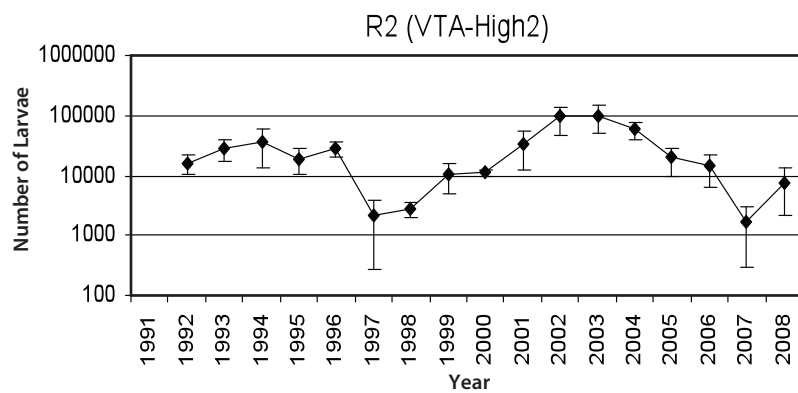
**Figure 3**  
**Coyote Ridge Population Zones**



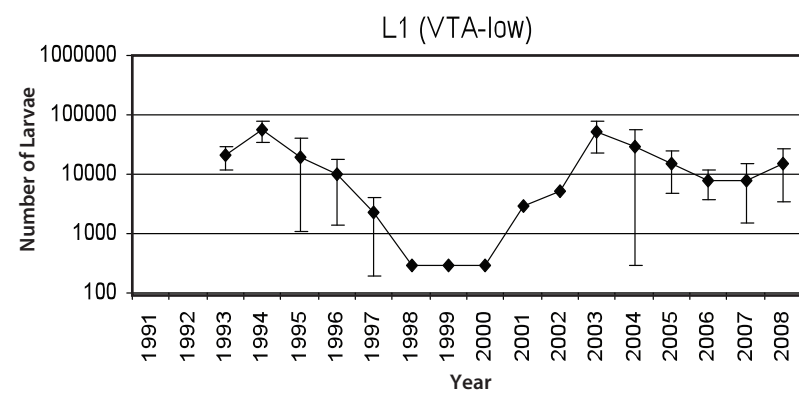
**Figure 4a. Population Trends at Kirby Canyon Trust Butterfly Leasehold**



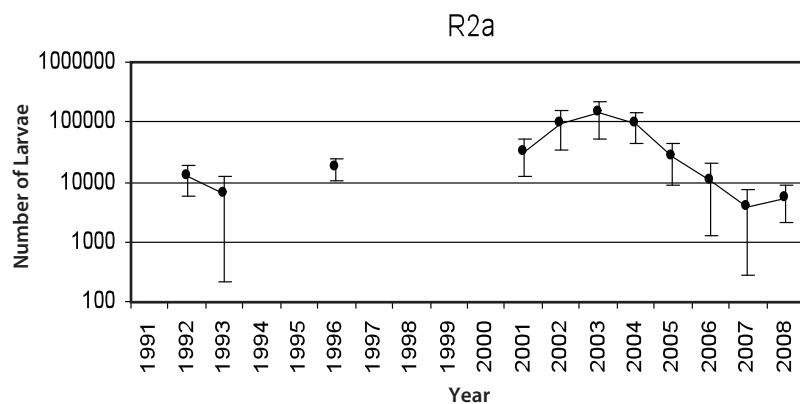
**Figure 4b. Population Trends at VTA High 1**



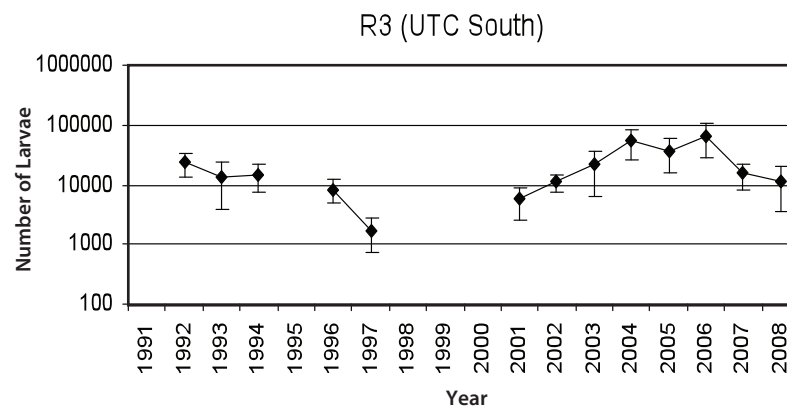
**Figure 4c. Population Trends at VTA High 2**



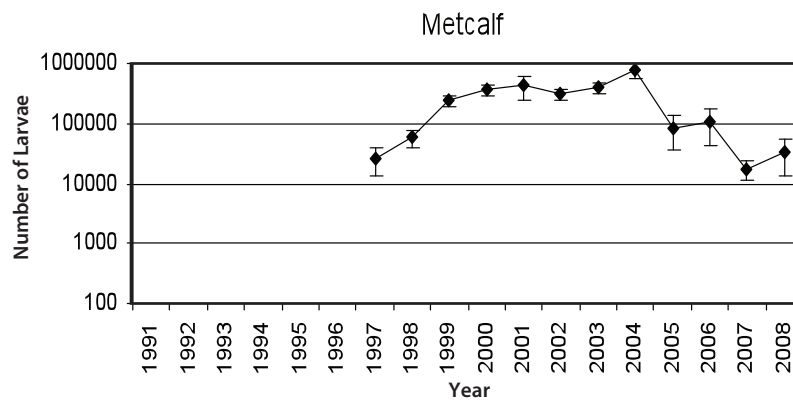
**Figure 4d. Population Trends at VTA Low**



**Figure 4e. Population Trends at R2a**



**Figure 4f. Population Trends at UTC South**



**Figure 4g. Population Trends at Metcalf**





## California Tiger Salamander (*Ambystoma californiense*)

### Legal Status

**State:** Threatened<sup>1</sup>

**Federal:** Central California population listed as Threatened (U.S. Fish and Wildlife Service 2004); Sonoma County and Santa Barbara County populations listed as Endangered (U.S. Fish and Wildlife Service 2000, 2003)<sup>2</sup>

**Critical Habitat:** Designated for the central California population only on August 23, 2005 (U.S. Fish and Wildlife Service 2005a)

**Recovery Planning:** None for central California population. A recovery strategy has been developed for the Sonoma County population (U.S. Fish and Wildlife Service 2005b)



### Taxonomy

Formerly regarded as a subspecies of *A. tigrinum*, the California tiger salamander (*Ambystoma californiense*) was first described by Gray in 1853 based on specimens that had been collected in Monterey, California. Based on recent studies of the genetics, geographic distribution, and ecological differences among the members of *A. tigrinum* complex, the California tiger salamander has been determined to represent a distinct species (U.S. Fish and Wildlife Service 2004).

The biogeographical and genetic information supporting the recognition of the Santa Barbara County and Sonoma County populations as distinct population segments under the federal Endangered Species Act are reviewed in those listing decisions (U.S. Fish and Wildlife Service 2000, 2003). More information on the taxonomic status and a description of the species' physical characteristics can be found in the listing decision for the central California population (U.S. Fish and Wildlife Service 2004).

<sup>1</sup> The California Fish and Game Commission determined that the California tiger salamander should be listed as threatened on May 20, 2010. This determination still needs to be finalized by the State Office of Administrative Law. The state listing applies to the entire range of this species.

<sup>2</sup> The 2004 listing of the central California population of the California tiger salamander (U.S. Fish and Wildlife Service 2004a) also downgraded the Sonoma County and Santa Barbara County populations of the species from endangered to threatened. However, an August 19, 2005 ruling from U.S. District Judge William Alsup vacated this downlisting, so these populations remain listed as endangered.

## Distribution

### General

The California tiger salamander is endemic to California. Historically, the California tiger salamander probably occurred in grassland habitats throughout much of the state. Although this species still occurs within much of its range, it has been extirpated from many areas it once occupied (Fisher and Shaffer 1996; Stebbins 1985). The loss of California tiger salamander populations has been due primarily to habitat loss within their historic range (Fisher and Shaffer 1996) (Figure 1).

Based on genetic analysis, there are six populations of California tiger salamanders, distributed as follows: (1) Santa Rosa area of Sonoma County, (2) Bay Area (central and southern Alameda, Santa Clara, western Stanislaus, western Merced, and the majority of San Benito counties), (3) Central Valley (Yolo, Sacramento, Solano, eastern Contra Costa, northeast Alameda, San Joaquin, Stanislaus, Merced, and northwestern Madera counties), (4) southern San Joaquin Valley (portions of Madera, central Fresno, and northern Tulare and Kings counties), (5) Central Coast range (southern Santa Cruz, Monterey, northern San Luis Obispo, and portions of western San Benito, Fresno, and Kern counties), and (6) Santa Barbara County (Shaffer and Trenham 2005).

Most populations occur at elevations below 1,500 feet, but California tiger salamanders have been recorded at elevations up to 3,660 feet, just below Rose Peak in the Ohlone Regional Wilderness, Alameda County (California Department of Fish and Game 2010). Although populations have declined, the species continues to breed at a large number of locations within its current range (59 FR § 18353–18354, April 18, 1994). At most historic breeding sites below 200 feet elevation, ponds remain present but no longer support California tiger salamanders. These sites are typically occupied by nonnative species (Fisher and Shaffer 1996).

## Occurrences within the Study Area

### Historical

There are records from throughout the study area from 1895 to 1990 (California Natural Diversity Database 2006). California tiger salamanders are thought extirpated from at least eight historical breeding areas (California Natural Diversity Database 2006). The eight extirpated sites all occur along the valley floor in the study area and follow the Highway 101 corridor. The extirpation of the species from these areas is likely due to habitat lost to development.

## Recent

There are approximately 100 occurrence records from 1990 through 2005 in the study area (California Natural Diversity Database 2006; T. Marker pers. comm.). The occurrences are scattered throughout the study area and on both sides of the valley, with large clusters of occurrences in Henry W. Coe State Park and Joseph D. Grant County Park. See Figure 2 for all recent occurrences.

## Natural History

### Habitat Requirements

California tiger salamanders require two major habitat components: aquatic breeding sites and terrestrial aestivation or refuge sites. California tiger salamanders inhabit valley and foothill grasslands and the grassy understory of open woodlands, usually within one mile of water (Jennings and Hayes 1994). Following metamorphosis California tiger salamanders are terrestrial animals which spend most of their time underground in subterranean refuge sites, or *refugia*. Underground retreats are usually California ground squirrel (*Spermophilus beechyii*) or pocket gopher (*Thomomys bottae*) burrows and, occasionally, human-made structures. Adults emerge from underground to breed, but only for brief periods during the year. California tiger salamanders breed and lay their eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); they sometimes use permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes that do not support predatory fish or bullfrogs (see *Ecological Relationships* discussion below) (Stebbins 1972; Zeiner et al. 1988). Streams are rarely used for reproduction.

Adult salamanders migrate from upland habitats to aquatic breeding sites during the first major rainfall events of fall and early winter and return to upland habitats after breeding. This species requires small-mammal burrows for cover during the non-breeding season and during migration to and from aquatic breeding sites (Zeiner et al. 1988). California tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990). California tiger salamanders can overwinter in burrows up to one mile from their breeding sites (Jennings and Hayes 1994) and have been documented up to ~1.2 mile (Sweet pers. comm.).

The California tiger salamander is particularly sensitive to the duration of ponding in aquatic breeding sites. Because tiger salamanders have a long developmental period, the longest lasting seasonal ponds or vernal pools are the most suitable type of breeding habitat for this species; these pools are also typically the largest in size (Jennings and Hayes 1994). Because at least 10 weeks are required to complete metamorphosis (see *Demography* below) (Feaver 1971), aquatic sites that are considered suitable for breeding should retain water for a minimum of 10 weeks. Moreover, large vernal pool complexes, rather than isolated pools, probably offer the best quality habitat;

these areas can support a mixture of core breeding sites and nearby refugia (Shaffer et al. 1994; Jennings and Hayes 1994).

California tiger salamanders primarily use California ground squirrel burrows as refuge sites (Loredo et al. 1996; Trenham 2001); Botta's pocket gopher (*Thomomys bottae*) burrows are also frequently used (Barry and Shaffer 1994; Jennings and Hayes 1994). Loredo et al. (1996) emphasized the importance of California ground squirrel burrows as refugia for California tiger salamanders, and suggested that a commensal relationship existed between the California tiger salamander and California ground squirrel, in which tiger salamanders benefit from the burrowing activities of squirrels. In a study conducted near Concord, California, Loredo et al. (1996) found that California ground squirrel burrows were used almost exclusively as refuge sites by California tiger salamanders. Also, tiger salamanders apparently do not avoid burrows occupied by ground squirrels (Loredo et al. 1996).

**Table 1.** Habitat Associations for California Tiger Salamander

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Herbaceous-dominated	Dispersal, refugia	Dispersal	Tiger salamanders can be found up to 1.3 mile (2.1 km) from wetlands and aquatic habitats, spend majority of lives in burrows in upland habitats	U.S. Fish and Wildlife Service 2004
Wetlands	Breeding, larval development	Breeding	All life stages occur around breeding sites	U.S. Fish and Wildlife Service 2004
Aquatic	Breeding, Larval development	Breeding	All life stages may occur around breeding sites	U.S. Fish and Wildlife Service 2004

## Reproduction

Adult California tiger salamanders migrate to and congregate at aquatic breeding sites during warm rains, primarily between November and February (Shaffer and Fisher 1991; Barry and Shaffer 1994). Tiger salamanders are rarely observed except during this period (Loredo et al. 1996). During the winter rains, tiger salamanders breed and lay eggs primarily in vernal pools and other shallow, ephemeral ponds that fill in winter and often dry by summer (Loredo et al. 1996). This species also uses permanent human-made ponds (without predatory fish) for reproduction. Spawning usually occurs within a few days after migration, and adults probably leave the breeding sites at night soon after spawning (Barry and Shaffer 1994 citing Storer 1925).

Eggs are laid singly or in clumps on both submerged and emergent vegetation and on submerged debris in shallow water. In ponds without vegetation, females lay eggs on objects on the pond bottom (Stebbins 1972; Shaffer and Fisher 1991; Barry and Shaffer 1994; Jennings and Hayes 1994). After breeding, adults leave the breeding ponds and return to their refugia (small mammal burrows, etc.).

After approximately two weeks, the salamander eggs begin to hatch into larvae. Once larvae reach a minimum body size they metamorphose into terrestrial juvenile salamanders. The amount of time that salamanders spend in the larval stage and the size of individuals at the time of metamorphosis seems to be dependent on many factors. Larvae in small ponds develop faster, while larvae in larger ponds that retain water for a longer period are larger at time of metamorphosis. At a minimum, salamanders require ten weeks living in ponded water to complete metamorphosis but in general development is completed in 3–6 months (Petranka 1998). If a pond dries prior to metamorphosis, the larvae will desiccate and die (U.S. Fish and Wildlife Service 2000). Juveniles disperse from aquatic breeding sites to upland habitats after metamorphosis (Storer 1925; Holland et al. 1990).

### Foraging Requirements

Aquatic larvae feed on algae, small crustaceans, and small mosquito larvae for about six weeks after hatching (U.S. Fish and Wildlife Service 2000). Larger larvae feed on zooplankton, amphipods, mollusks, and smaller tadpoles of Pacific treefrogs (*Pseudacris regilla*), California red-legged frogs (*Rana aurora draytoni*), western toads (*Bufo boreas*) and spadefoot toads (*Spea* spp.) (Zeiner et al. 1988; U.S. Fish and Wildlife Service 2000). Adults eat earthworms, snails, insects, fish, and small mammals (Stebbins 1972).

**Table 2.** Key Seasonal Periods for California Tiger Salamander

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding/Migration	✓	✓									✓	✓
Larval development			✓	✓	✓	✓	✓	✓				
Metamorphosis					✓	✓	✓	✓				
Juvenile Dispersal	✓	✓				✓	✓	✓	✓	✓	✓	✓
Sources: Jennings and Hayes 1994; Zeiner et al. 1988												

### Movement

The proximity of refuge sites to aquatic breeding sites also affects the suitability of salamander habitat. Adult tiger salamanders have been observed up to 1.3 miles (2.1 km) from breeding ponds (U.S. Fish and Wildlife Service 2004). A recent trapping effort in Contra Costa County captured California tiger salamanders at distances ranging from 2,641 feet to 3,960 feet from the nearest breeding, aquatic site (U.S. Fish and Wildlife Service 2004). In a study in winter 2002–2003, Trenham and Shaffer (2005) found that 95% of tiger salamanders resided within 2040 feet (620 meters) of their breeding pond in Solano County.

Loredo et al. (1996) found that tiger salamanders may use burrows that are first encountered during movements from breeding to upland sites. In their study

area, where the density of California ground squirrel burrows was high, the average migration distances between breeding and refuge sites for adults and juveniles was 118 feet (35.9 meters) and 85 feet (26.0 meters), respectively. Also, habitat complexes that include upland refugia relatively close to breeding sites are considered more suitable because predation risk and physiological stress in California tiger salamanders probably increases with migration distance.

Dispersal of juveniles from natal ponds to underground refugia could occur throughout the year. While juveniles will move short distances from breeding ponds once they start to dry up in the late spring and summer, longer distances from breeding ponds are attained during rainy periods. Juveniles disperse from breeding sites after spending a few hours or days near the pond margin (Jennings and Hayes 1994). Juveniles have been observed to migrate up to 1 mile from breeding pools to upland areas (U.S. Fish and Wildlife Service 2004). Dispersal distance is likely phased and may increase with an increase in precipitation (Trenham 2001).

Some genetic data suggest low rates of California tiger salamander migration between vernal pool complexes (Shaffer et al. 1994; Irschick and Shaffer 1997) or metapopulations; this suggests that natural colonization after a local extirpation event may be unlikely (Fisher and Shaffer 1996). Trenham et al. (2001) showed that pool complexes occupied by California tiger salamander fit a metapopulation model, and dispersal rates between ponds may be high for both first-time and experienced breeders. Dispersal rates are probably high enough to prevent local extirpations within a pool complex.

**Table 3.** Movement Distances for California Tiger Salamander

Type	Distance/Area	Location of Study	Citation
Adult migration	620 meters	Jepson Prairie Preserve	Trenham and Shaffer 2005
	2,641–3,960 feet	Contra Costa County	U.S. Fish and Wildlife Service 2004
	0.9–1.3 mile	Santa Barbara	Sweet pers. comm. 2006
Juvenile migration	630 meters	Jepson Prairie Preserve	Trenham and Shaffer 2005
	700 meters	Monterey County	Trenham et al. 2001

## Ecological Relationships

California tiger salamander larvae and embryos are susceptible to predation by fish (Stebbins 1972; Zeiner et al. 1988; Shaffer et al. 1994), and tiger salamander larvae are rarely found in aquatic sites that support predatory fish (Shaffer and Fisher 1991; Shaffer and Stanley 1992; Shaffer et al. 1994). Aquatic larvae are taken by herons and egrets and possibly garter snakes (Zeiner et al. 1988). Shaffer et al. (1993) also found a negative correlation between the occurrence of California tiger salamanders and the presence of bullfrogs; however, this relationship was detected only in unvegetated ponds. This suggests that vegetation structure in aquatic breeding sites may be important for survival.

Because of their secretive behavior and limited periods above ground, adult California tiger salamanders have few predators (U.S. Fish and Wildlife Service 2000).

## Population Status and Trends

**Global:** *Declining* (NatureServe 2006) (Endemic to California)

**State:** Declining

**Within Study Area:** Unknown

## Threats

California tiger salamander populations have experienced dramatic declines throughout the historical range of the species, particularly in the Central Valley. California tiger salamander populations have declined as a result of two primary factors: widespread habitat loss and habitat fragmentation. These factors have both been caused by conversion of valley and foothill grassland and oak woodland habitats to agricultural and urban development (Stebbins 1985). For example, residential development and land use changes in the California tiger salamander's range have removed or fragmented vernal pool complexes, eliminated refuge sites adjacent to breeding areas, and reduced habitat suitability for the species over much of the Central Valley (Barry and Shaffer 1994; Jennings and Hayes 1994). Grading activities have probably also eliminated large numbers of salamanders directly (Barry and Shaffer 1994). Overall, approximately 75% of habitat for California tiger salamander within its historic range has been lost (Fisher and Shaffer 1996).

The introduction of bullfrogs, Louisiana red swamp crayfish, and nonnative fishes (mosquitofish, bass, and sunfish) into aquatic habitats has also contributed to declines in tiger salamander populations (Jennings and Hayes 1994; 59 FR § 18353–18354, April 18, 1994, U.S. Fish and Wildlife Service 2000). These nonnative species prey on tiger salamander larvae and may eliminate larval populations from breeding sites (Jennings and Hayes 1994). At sites where aquatic vegetation is present, predation by exotic fish appears more likely to result in California tiger salamander extirpation than bullfrogs (Fisher and Shaffer 1996). At most historic breeding sites below 200 feet elevation, ponds remain present but no longer support California tiger salamanders. Instead, these sites are typically occupied by nonnative species (Fisher and Shaffer 1996).

Burrowing-mammal control programs are considered a threat to California tiger salamander populations. Rodent control through destruction of burrows and release of toxic chemicals into burrows can cause direct mortality to individual salamanders and may result in a decrease of available suitable habitat (U.S. Fish and Wildlife Service 2000).

Vehicular-related mortality is an important threat to California tiger salamander populations (Barry and Shaffer 1994; Jennings and Hayes 1994). California tiger salamanders readily attempt to cross roads during migration, and roads that



sustain heavy vehicle traffic or barriers that impede seasonal migrations may have impacted tiger salamander populations in some areas (Shaffer and Fisher 1991; Shaffer and Stanley 1992; Barry and Shaffer 1994). Therefore, establishing artificial barriers to movement or maintaining roads that support a considerable amount of vehicle traffic in areas that support California tiger salamander populations could severely degrade salamander habitat (see Jennings and Hayes 1994).

Hybridization between California tiger salamander and an introduced congener, *A. tigrinum*, has been documented and may be extensive (Riley et al. 2003). *A. tigrinum* was introduced to California for use as fishing bait; and both taxa co-occur in ponds and vernal pools. Hybridization between native and exotic taxa, due to lack of reproductive isolation, can threaten native taxa by causing genetic swamping and reduced genetic diversity of native populations. In rare species such as California tiger salamander, hybridization can also lead to population extirpation. In a study of tiger salamander hybridization conducted in the Salinas Valley, Riley et al. (2003) found that the degree of genetic mixing between California tiger salamander and *A. tigrinum* depended on breeding habitat type. In artificial ponds, there appeared to be no barriers to gene exchange between California tiger salamander and *A. tigrinum*. However, in vernal pools, significantly fewer hybrid genotypes and more pure parental genotypes were found. These results suggest that the potential for reproductive isolation between the two taxa may be higher in native habitats. See **Appendix K** for more details on hybridization between California tiger salamanders and nonnative salamanders.

## Data Characterization

Because this species is listed under the federal Endangered Species Act it has received much attention within its range, including within the study area. Stock ponds are one of the primary likely sources of breeding habitat within the study area. Most of these stock ponds have not been surveyed for California tiger salamanders use, particularly those in remote parts of the study area. Most of the suitable habitat that is threatened by development or other changes in land use has been adequately surveyed, and the threats to the species within the study area have been accurately identified.

## Existing Conservation Actions in the Study Area

Santa Clara Valley Water District has been conducting ongoing amphibian surveys in several areas in its jurisdiction, including stock ponds in Carnadero Preserve, Palassou Ridge, and Henry W. Coe State Park (D. Padley pers. comm.). The Santa Clara County Open Space Authority conducts pond and wetland restoration on their lands that is designed to benefit California tiger salamander and other species.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Assumptions

##### Breeding and Foraging

Potential breeding habitat within the study area is assumed to be all ponds (excluding percolation ponds), coastal and valley freshwater marshes, natural lakes, and seasonal wetlands within riparian, grassland, oak woodland, and conifer woodland land cover types.

##### Upland Refugia and Dispersal Habitat

Upland habitats that provide subterranean refugia for this species are assumed to be within 1.3 miles of primary habitat in grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, riparian forest/woodland wetlands, conifer woodlands, and agricultural areas.

#### Rationale

California tiger salamanders require two major habitat components: aquatic breeding sites and upland or refuge sites. California tiger salamanders inhabit valley and foothill grasslands and the grassy understory of open woodlands, usually within 1.3 miles of water (U.S. Fish and Wildlife Service 2005a). The California tiger salamander is terrestrial as an adult and spends most of its time underground in subterranean refugia. Underground retreats usually consist of ground-squirrel burrows and occasionally human-made structures. Adults emerge from underground to breed, but only for brief periods during the year. Tiger salamanders breed and lay their eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); they sometimes use permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes that do not support predatory fish or bullfrogs (see *Ecological Relationships* discussion below) (Stebbins 1972; Zeiner et al. 1988). Streams are rarely used for reproduction.

Breeding salamanders migrate from upland habitats to aquatic breeding sites during major rainfall events of fall and early winter and return to upland habitats after breeding. This species requires small-mammal (e.g., California ground squirrel) burrows for cover during the non-breeding season and during migration to and from aquatic breeding sites (Zeiner et al. 1988). California tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990). California tiger salamanders may occupy burrows up to 1.3 mile from their breeding sites during the non-breeding period (U.S. Fish and Wildlife Service 2005a).

## Model Results

Figure 2 shows the modeled potential habitat for the California tiger salamander within the study area. The model output designates breeding habitat and bases upland and dispersal habitat on known movement distances determined by the best knowledge of the species. Suitable habitat for this species is spread evenly throughout the undeveloped portions of the study area, primarily due to the even distribution of stock ponds and other aquatic habitat.

## Literature Cited

### Printed References

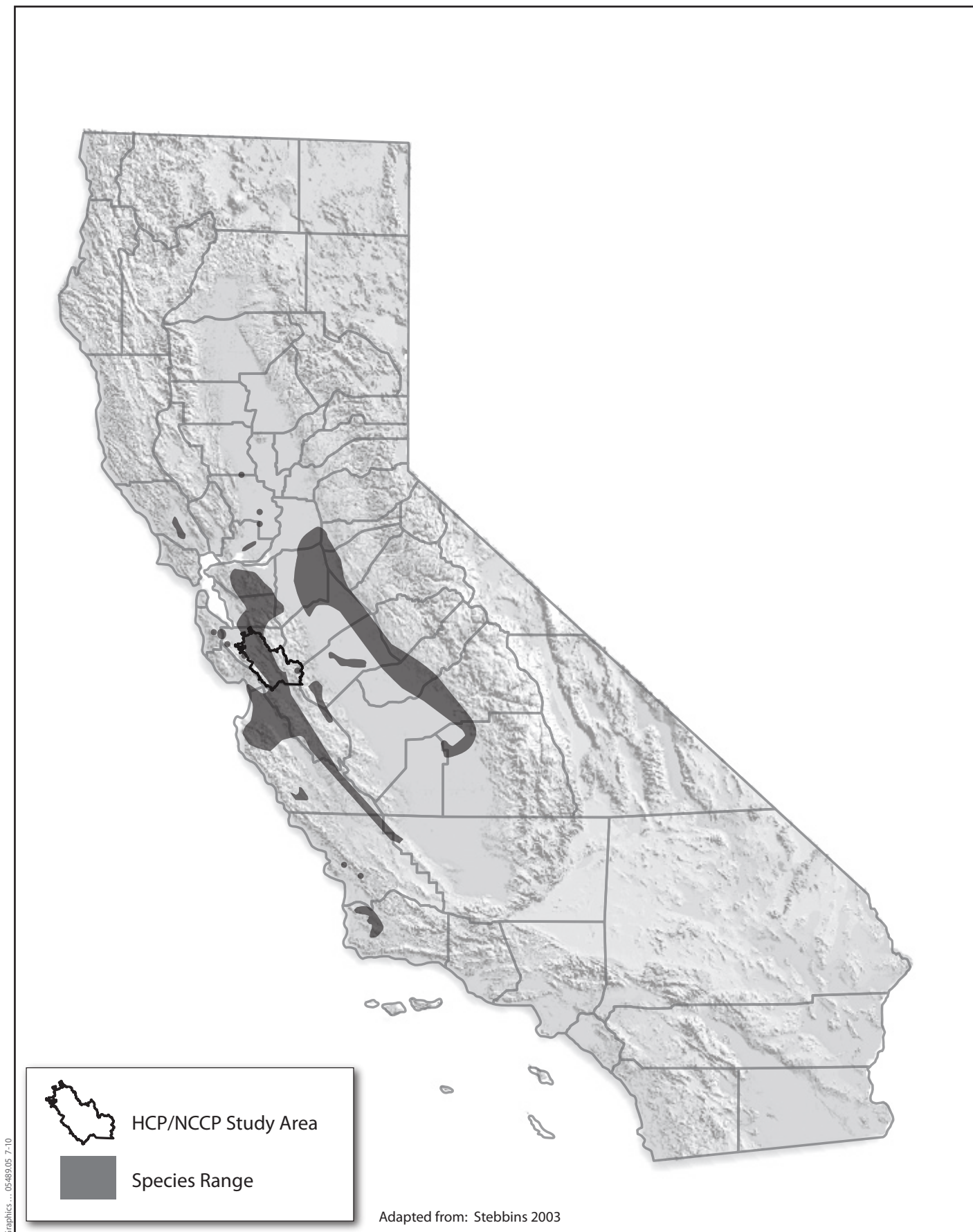
- Barry, S.J. and H.B. Shaffer. 1994. The Status of the California Tiger Salamander (*Ambystoma californiense*) at Lagunita: A 50-Year Update. *Journal of Herpetology* 28:159–164.
- California Department of Fish and Game. 2010. *Report to the Fish and Game Commission: Status Review of the California Tiger Salamander* (*Ambystoma californiense*). January 11, 2010.
- California Natural Diversity Database. 2006. California Department of Fish and Game. Updated March 31, 2006.
- Feaver, P.E. 1971. *Breeding Pool Selection and Larval Mortality of Three California Amphibians: Ambystoma tigrinum californiense Gray, Hyla regilla Baird and Girard, and Scaphiopus hammondi Girard*. M.A. Thesis. Fresno State College. Fresno, CA.
- Fisher, R.N. and H.B. Shaffer. 1996. The Decline of Amphibians in California's Great Central Valley. *Conservation Biology* 10:1387–1397.
- Holland, D.C., M.P. Hayes, and E. McMillan. 1990. Late Summer Movement and Mass Mortality in the California Tiger Salamander (*Ambystoma californiense*). *Southwestern Naturalist* 35:217–220.
- Irschick, D.J. and H.B. Shaffer. 1997. The Polytypic Species Revisited: Morphological Differentiation among Tiger Salamanders (*Ambystoma tigrinum*) (Amphibia: Caudata). *Herpetologica* 53:30–49.
- Jennings, M.R., and M.P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Prepared for the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.
- Loredo, I., D. Van Vuren, and M.L. Morrison. 1996. Habitat Use and Migration Behavior of the California Tiger Salamander. *Journal of Herpetology* 30:282–285.

- NatureServe. 2006. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: June 21, 2006.
- Petranka, J.W. 1998. *Salamanders of the United States and Canada*. Washington, DC: Smithsonian Institution Press.
- Riley, S.P.D., H.B. Shaffer, R. Voss, and B.M. Fitzpatrick. 2003. Hybridization between a Rare, Native Tiger Salamander (*Ambystoma californiense*) and Its Introduced Congener. *Ecological Applications* 13:1263–1275.
- Shaffer, H.B., and R. Fisher. 1991. *California Tiger Salamander Surveys, 1990*. (Final Report.) (Contract FG 9422). Prepared for California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.
- Shaffer, H.B., and S. Stanley. 1992. *California Tiger Salamander Surveys, 1991*. (Contract FG 9422). Prepared for California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.
- Shaffer, H.B. and P.C. Trenham. 2005. *Ambystoma californiense*. Pages 1093–1102 in M.J. Lannoo (ed.), *Status and Conservation of U.S. Amphibians*. Volume 2: *Species Accounts*. Berkeley, CA: University of California Press.
- Shaffer, H.B., R.N. Fisher, and S.E. Stanley. 1993. Status Report: the California Tiger Salamander (*Ambystoma californiense*). Final report for the California Department of Fish and Game.
- Shaffer, H.B., R.N. Fisher, and S.E. Stanley. 1994. *Status Report: The California Tiger Salamander* (*Ambystoma californiense*). (Final.) (Contracts FG 9422 and FG 1383.) Prepared for California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.
- Stebbins, R.C. 1972. *California Amphibians and Reptiles*. Pg. 152. Berkeley, CA: University of California Press.
- Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians*. (Second Edition, Revised.) Boston, MA: Houghton Mifflin Company.
- Storer, T.I. 1925. A Synopsis of the Amphibia of California: University of California Publication. *Zoology* 27:1–342.
- Trenham, P.C. 2001. Terrestrial Habitat Use by Adult California Tiger Salamanders. *Journal of Herpetology* 35:343–346.
- Trenham, P.C., and H.B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. *Ecological Applications* 15:1158–1168.

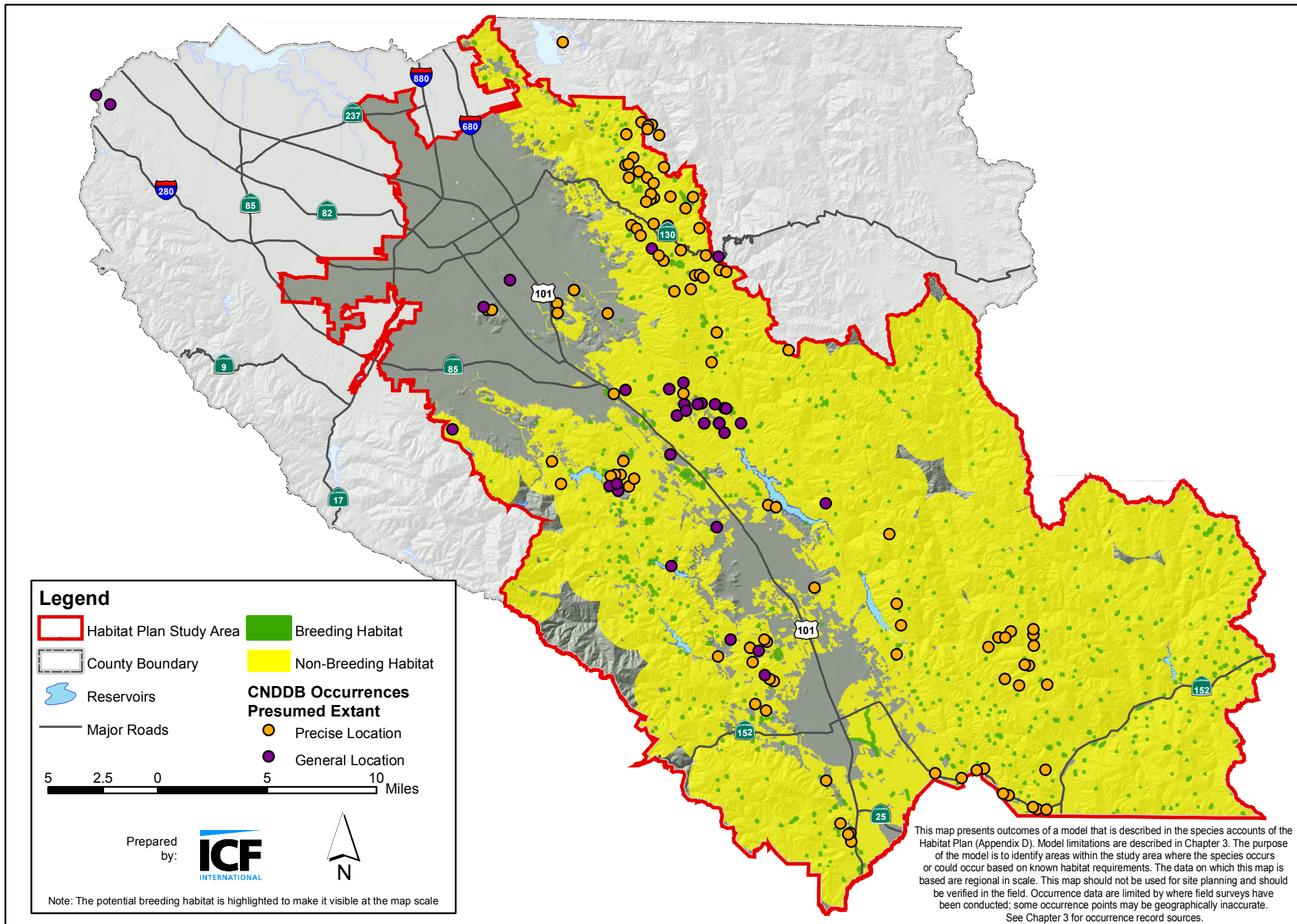
- Trenham, P.C., W.D. Koenig, and H.B. Shaffer. 2001. Spatially Autocorrelated Demography and Interpond Dispersal in the Salamander *Ambystoma californiense*. *Ecology* 82:3519–3530.
- U.S. Fish and Wildlife Service. 2000. *Endangered and Threatened Wildlife and Plants; Final Determination of Endangered Status for the Santa Barbara County Distinct Vertebrate Population Segment of the California Tiger Salamander* (*Ambystoma californiense*).
- . 2003. *Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Sonoma County Distinct Population Segment of the California Tiger Salamander*. (Final Rule.) 68 FR 53:13497–13520 (March 19).
- . 2004. *Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the California Tiger Salamander; and Special Rule Exemptions for Existing Routine Ranching Activities*. (Final Rule.) 69 FR 149:47212–47248 (August 4).
- . 2005a. *Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the California Tiger Salamander, Central Population, Final Rule*. Federal Register 70(162):49380–49458. August 23.
- . 2005b. Santa Rosa Plain Conservation Strategy. December 1. Available: <[http://www.fws.gov/sacramento/es/santa\\_rosa\\_conservation.html](http://www.fws.gov/sacramento/es/santa_rosa_conservation.html)>.
- Zeiner, D.C., W.F. Laudenslayer, Jr., and K.E. Meyer. 1988. *California's Wildlife*. Volume I: *Amphibians and Reptiles*. Sacramento, CA: California Department of Fish and Game. May 2.

## Personal Communications

- Padley, W.D. Biologist with Ecological Services Unit, Watershed Management Operations, Santa Clara Valley Water District. March 13, 2006. Telephone conversation with Stephanie Myers.
- Marker, T. Manager of Environmental Engineering, Pratt & Whitney Rocketdyne, United Technologies Company. January 22, 2007. Letter to Troy Rahmig.
- Sweet, S. Professor in the Ecology, Evolution, and Marine Biology Department, University of California, Santa Barbara. October 20, 2006. Email message to Troy Rahmig.







**Figure 2**  
**California Tiger Salamander Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## California Red-Legged Frog (*Rana draytonii*)



### Legal Status

**State:** Species of Special Concern

**Federal:** Threatened

**Critical Habitat:** Designated April 2006 (U.S. Fish and Wildlife Service 2006); Revised March 2010 (U.S. Fish and Wildlife Service 2010)

**Recovery Planning:** Final Recovery Plan May 2002 (U.S. Fish and Wildlife Service 2002)

**Notes:** Status not anticipated to change during permit period

### Taxonomy

The California red-legged frog and northern red-legged frog (*R. a. aurora*) are considered conspecific subspecies with a broad zone of intergradation (Shaffer et al. 2004). Some red-legged frogs found in the intervening areas (southern Del Norte to northern Marin County along the Coast Range), exhibit intergraded characteristics of both subspecies (Hayes and Krempels 1986 in U.S. Fish and Wildlife Service 2002). The two subspecies, and intergrades of the subspecies, may occur together in Mendocino County (U.S. Fish and Wildlife Service 2002).

Descriptions of the species' physical characteristics can be found in the U.S. Fish and Wildlife Service Recovery Plan (U.S. Fish and Wildlife Service 2002).

### Distribution

#### General

The historical range of the California red-legged frog (*Rana draytonii*) extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, California, and inland from Redding, Shasta County southward to northwestern Baja California, Mexico (Jennings and Hayes 1985; Hayes and Krempels 1986). The current distribution is in isolated patches in the Sierra Nevada, northern Coast, and Santa Monica Mountains (Hogan pers. comm.). It is still common in the San Francisco Bay area and along the central coast. In Southern California the species is believed extirpated from the Santa Rosa Ecological Reserve but persists in the Santa Monica Mountains and in San Fransquito Canyon in Newhall (Hogan pers. comm.) (Figure 1).



## Occurrences within the Study Area

### Historical

The red-legged frog was historically found throughout Santa Clara County. There are a number of historic red-legged frog records within the study area dating from 1904 to 1980 (Padley pers. comm.). The observations are shown in Figure 2 and represent museum and California State University at San José records (1904 through 1983), as well as unpublished California Department of Fish and Game records (no specific dates; observed before 1980).

### Recent

An analysis of known locality records for red-legged frog from Santa Clara County (H.T. Harvey and Associates 1997) concluded that the species has essentially disappeared from the urbanized lowland areas of the county as well as from the brackish marshlands bordering the San Francisco Bay. Extant riparian habitats within this region are largely channelized or contain a wide variety of introduced predatory fishes and bullfrogs (Padley pers. comm.). However, red-legged frogs are still found in the foothill and mountain ranges throughout the county (H.T. Harvey and Associates 1997).

According to the California Natural Diversity Database (CNDDB), 93 occurrences of California red-legged frog have been documented within the study area (California Natural Diversity Database 2006). U.S. Fish and Wildlife Service (2002) reports that adult frogs have been observed in Upper Alameda Creek in the Sunol Regional Wilderness, and in many creeks from this area, south to Henry W. Coe State Park.

Approximately half of the occurrences are in creek and pond habitats in Henry W. Coe State Park (Figure 2). Twenty-four of the occurrences are on private property, while the remaining occurrences are on public properties, including City of San José, Santa Clara Valley Water District, and Santa Clara County properties.

## Natural History

### Habitat Requirements

Within their range, California red-legged frogs occur from sea level to about 5,000 feet above sea level (U.S. Fish and Wildlife Service 2002). Almost all of the documented occurrences of this species, however, are located below 3,500 feet. Breeding sites include a variety of aquatic habitats—larvae, tadpoles, and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons. Breeding adults are commonly found in deep (more than 2 feet) still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1989).

Adult frogs have also been observed in shallow sections of streams that are not shrouded by riparian vegetation. Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles. Stock ponds are frequently used by this species if the ponds are managed to provide suitable hydroperiod, pond structure, vegetative cover, and control of nonnative predators.

During summer, California red-legged frogs often disperse from their breeding habitat to forage and seek summer habitat if water is not available (U.S. Fish and Wildlife Service 2002). This habitat may include shelter under boulders, rocks, logs, industrial debris, agricultural drains, watering troughs, abandoned sheds, or hayricks. The frogs will also use small mammal burrows, incised streambed channels, or areas with moist leaf litter (Jennings and Hayes 1994; U.S. Fish and Wildlife Service 1996, 2002). However, this summer movement behavior has not been observed in all California red-legged frog populations studied.

California red-legged frogs consume a wide variety of prey. Adult frogs typically feed on aquatic and terrestrial insects, crustaceans, and snails (Stebbins 1985, Hayes and Tennant 1985), as well as worms, fish, tadpoles, smaller frogs (e.g., *Hyla regilla*), and occasionally mice (*Peromyscus* spp.) (U.S. Fish and Wildlife Service 2002). Aquatic larvae are mostly herbivorous algae grazers (Jennings et al. 1992). Feeding generally occurs along the shoreline of ponds or other watercourses and on the water surface. Juveniles appear to forage during both daytime and nighttime, whereas subadults and adults tend to feed more exclusively at night (Hayes and Tennant 1985).

**Table 1.** Habitat Associations for California Red-Legged Frog

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Herbaceous-dominated	Dispersal, forage, refugia	Secondary, movement	Occur in open grasslands with seeps and springs (within 2 miles of seeps, springs, creeks, ponds, and lakes).	Such water sources are too ephemeral for breeding but may provide foraging and refugia habitat for dispersing frogs (U.S. Fish and Wildlife Service 2005)
Riparian woodland	Dispersal, forage, refugia	Secondary, year-round movement, summer	Frogs can be found up to 100 meters from emergent vegetation, undercut banks, rootballs, or small mammal burrows which all provide shelter.	U.S. Fish and Wildlife Service 2002, 2005
Riparian scrub	Dispersal, forage, refugia	Secondary, year-round movement, summer	Same as for riparian woodland.	U.S. Fish and Wildlife Service 2002, 2005
Wetlands	All life stages	Primary, breeding, refugia	All life stages may occur around breeding sites, or frogs may seek multiple habitats.	U.S. Fish and Wildlife Service 2002, 2005
Aquatic	All life stages	Primary, breeding, refugia	All life stages may occur around breeding sites, or frogs may seek multiple habitats.	U.S. Fish and Wildlife Service 2002, 2005

## Reproduction

California red-legged frogs breed from November through April (Storer 1925; U.S. Fish and Wildlife Service 2002). Males usually appear at the breeding sites 2 to 4 weeks before females. Females are attracted to calling males. Females lay egg masses containing about 2,000 to 5,000 eggs, which hatch in 6 to 14 days, depending on water temperatures (U.S. Fish and Wildlife Service 2002). Those eggs develop into tadpoles in 20–22 days. Larvae metamorphose in 3.5 to 7 months, typically between July and September (Storer 1925; Wright and Wright 1949; U.S. Fish and Wildlife Service 2002). Males usually attain sexual maturity at 2 years of age and females at 3 years of age.

**Table 2.** Key Seasonal Periods for California Red-Legged Frog

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding	✓	✓	✓	✓							✓	✓
Larval development			✓	✓	✓	✓	✓	✓	✓			
Metamorphosis								✓	✓	✓		

Source: U.S. Fish and Wildlife Service 2002.

## Movement

California red-legged frogs may move over 2 miles up or down drainages from breeding sites and have been observed using adjacent riparian woodlands up to 100 feet from the water (Rathbun et al. 1993). Dispersing frogs have been recorded to cover distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger 1998). These dispersal movements are generally straight-line, point-to-point migrations rather than following specific habitat corridors. Dispersal distances are believed to depend on the availability of suitable habitat and prevailing environmental conditions. Generally speaking, red-legged frogs will use the extent of a riparian corridor no matter how narrow or wide it is. The primary features driving the use of this habitat are cool moist soil under shrubs or other vegetation where frogs can find refuge for short periods before returning to the water.

On rainy nights, red-legged frogs may roam away from aquatic sites as much as one mile. Red-legged frogs often move away from the water after their first winter, causing sites where red-legged frogs were easily observed in the summer months to appear devoid of this species. Additionally, red-legged frogs sometimes disperse in response to receding water, which often occurs during the driest time of the year (U.S. Fish and Wildlife Service 2005).

**Table 3.** Movement Distances for California Red-Legged Frog

Type	Distance/Area	Location of Study	Citation
Dispersal/migration	0.25 to 2 miles	Santa Cruz County	Bulger et al. 2003
Dispersal/migration	9 to 48 feet	Ventura County	Rathbun et al. 1993, U.S. Fish and Wildlife Service 2005

Note: Disparity in distances between the two studies is likely a function of riparian corridor width or habitats adjacent to riparian areas.

## Ecological Relationships

California red-legged frogs are primary, secondary, and tertiary consumers in the aquatic/terrestrial food web of their habitat. As described above, they prey on a variety of invertebrates and vertebrates, as well as algae and larvae. Numerous native predators prey on these frogs, including raccoons (*Procyon lotor*), great blue herons (*Ardea herodias*), American bitterns (*Botaurus lentiginosus*), black-crowned night herons (*Nycticorax nycticorax*), red-shouldered hawks (*Buteo lineatus*), opossums (*Didpephis virginiana*), striped skunks (*Mehpitis mephitis*), spotted skunks (*Spilogale pituorius*), and garter snakes (*Thamnophis* spp.) (Fitch 1940; Fox 1952; Jennings and Hayes 1990; Rathbun and Murphy 1996). In some areas, introduced aquatic vertebrates and invertebrates also prey on one or more of the life stages of California red-legged frogs. These predators include bullfrogs (*Rana catesbeiana*), African clawed frogs (*Xenopus laevis*), red swamp crayfish (*Procambarus clarkii*), signal crayfish (*Pacifastacus leniusculus*), bass (*Micropterus* spp.), catfish (*Ictalurus* spp.), sunfish (*Lepomis* spp.), and mosquitofish (*Gambusia affinis*) (Hayes and Jennings 1986).

Adult California red-legged frogs can live 8 to 10 years (Jennings et al. 1992), but the average life span is probably much lower (U.S. Fish and Wildlife Service 2002). Most mortality occurs during the tadpole stage (Licht 1974). No long-term studies have been conducted on the population dynamics of red-legged frogs.

## Population Status and Trends

### Population Trend

**Global:** Declining (NatureServe 2006)

**State:** Declining (Jennings et al. 1992)

**Within Study Area:** Declining (Jennings et al. 1992)

Although population numbers are not precisely known, the U.S. Fish and Wildlife Service estimates that California red-legged frog populations are declining at a rapid rate. A 70% reduction in the geographic range of this subspecies was witnessed in the early to mid-1990s. This decline was primarily a

result of habitat loss and alteration and introduction of exotic predators (U.S. Fish and Wildlife Service 2002).

## Threats

Threats to the species include removal and alteration of habitat due to urbanization, overgrazing of aquatic and riparian habitats, and predation by nonnative species. During a controlled study in 1995, Lawler et al. (1999) found that fewer than 5% of California red-legged frog tadpoles will survive in ponds with bullfrogs present. The viability of California red-legged frog populations is threatened by numerous human activities that often act synergistically and cumulatively with natural disturbances (i.e., droughts or floods) (U.S. Fish and Wildlife Service 2002). These activities include the degradation, fragmentation, and loss of habitat through agriculture, mining, recreation, timber harvesting, nonnative plants, impoundments, water diversions, degraded water quality, introduced predators, and poorly managed infrastructure maintenance activities, such as road construction and repair. These activities can degrade California red-legged frog habitat by increasing disturbance, reducing water quality, or increasing competition and predation pressure.

Habitat along many stream courses has been isolated and fragmented, resulting in reduced connectivity between populations and lowered dispersal opportunities. These isolated populations are now more vulnerable to extinction through stochastic environmental events (i.e., drought, floods) and human-caused impacts (i.e., grazing disturbance, contaminant spills) (Soulé 1998).

In a comprehensive evaluation of prevailing hypotheses on the causes of declines in California red-legged frog populations, Davidson et al. (2001) determined that there is a strong statistical correlation between locations where frog numbers had declined and upwind agricultural land use. They concluded that wind-borne agrochemicals might be an important factor in these declines.

Livestock grazing can have positive or negative impacts on breeding California red-legged frogs depending largely on intensity. Livestock grazing may decrease the suitability of riparian habitat to sustain California red-legged frog populations within the study area. Cattle degrade riparian habitat because they congregate in these areas and trample riparian vegetation. This loss of streamside vegetation can result in increased erosion, increased water temperatures, and reduced numbers of available prey. Conversely, in some grazing areas, artificially created stock ponds provide ideal breeding habitat for California red-legged frog, and grazing may help maintain pond suitability by keeping ponds from being choked with vegetation (U.S. Fish and Wildlife Service 2002).

Finally, gravel mining can degrade habitat by altering the hydrology of aquatic systems, increasing sedimentation, and degrading water quality (U.S. Fish and Wildlife Service 2002).

## Data Characterization

As noted above, the CNDDDB contains 93 documented occurrences of the species in the study area. Existing information should be sufficient to evaluate habitat suitability in the study area. However, much of the HCP/NCCP study area includes private lands that have not been surveyed systematically for this species. The species' ecology, dispersal, and reproduction is relatively well studied.

## Existing Conservation Actions in the Study Area

Biologists from the Santa Clara Valley Water District have surveyed many areas within the streams of Santa Clara County for California red-legged frogs and plan to expand the survey program in upcoming years (U.S. Fish and Wildlife Service 2002; Padley pers. comm.). Other conservation actions for California red-legged frog known in the study area are plans to conduct bullfrog removal in key stock ponds within Henry W. Coe State Park (B. Breckling pers. comm.).

## Modeled Species Distribution in Study Area

### Model Description

#### Model Assumptions

##### Primary Habitat—Breeding and Foraging

All riverine, coastal and valley freshwater marshes, riparian forest/woodland wetlands, ponds (excluding percolation ponds), and natural lakes in riparian forest/scrub, grasslands, oak woodland, chaparral and coastal scrub, conifer woodland, and agriculture land cover types were considered potential breeding and foraging habitat for California red-legged frog.

##### Secondary Habitat—Movement and Refugia

All grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, and conifer woodland land cover types within 100 feet of primary habitat are characterized as upland refugia. All grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, conifer woodland, and agriculture land cover types beyond 100 feet but within 2 miles of primary habitat are characterized as dispersal habitat.

### Rationale

**Breeding and foraging habitat:** Breeding sites used by California red-legged frogs include a variety of aquatic habitats (Stebbins 1985; Hayes and Jennings 1988). Larvae, tadpoles, and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds, and marshes. Breeding adults are commonly

found in deep (more than 2 feet), still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Adult frogs have also been observed in shallow sections of streams that are not shrouded by riparian vegetation. Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles. Within the Santa Clara Valley HCP/NCCP study area, stock ponds are frequently used as breeding sites by this species. All existing ponds and streams within the study area were, therefore, considered potential suitable breeding habitats for California red-legged frogs.

**Movement and refugia habitat:** During dry weather, California red-legged frogs likely remain in or near water. California red-legged frogs may move over 2 miles up or down drainages from breeding sites and have been observed using adjacent riparian woodlands up to 100 feet from the water (Rathbun et al. 1993). However, as ponds dry out, these frogs disperse from their breeding sites to other areas with water or to temporary shelter or aestivation sites. For this reason, all grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, and conifer woodland land cover types within 100 feet of primary habitat are characterized as upland refugia.

Dispersing frogs have been recorded to cover distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger 1998). This habitat may include small mammal burrows, incised stream channels, shelter under boulders, rocks, logs, leaf litter, agricultural drains, watering troughs, abandoned sheds, or unused farm equipment (Jennings and Hayes 1994). Dispersal and migration movements are generally straight-line, point-to-point migrations rather than following specific habitat corridors (U.S. Fish and Wildlife Service 2000b; Stebbins 2002). They may be along long-established historic migratory pathways that provide specific sensory cues that guide the seasonal movement of the frogs (Stebbins 2002). Dispersal distances are believed to depend on the availability of suitable habitat and prevailing environmental conditions. However, because the actual movement patterns of California red-legged frogs in these habitats is generally not known, for this model we conservatively estimated that all grassland, chaparral and coastal scrub, oak woodland, riparian forest/scrub, conifer woodland, and agriculture land cover types beyond 100 feet but within a radius of two miles from all potential breeding sites were potential migration and/or aestivation habitats for California red-legged frogs.

## Model Results

Figure 2 shows the modeled potential habitat for the California red-legged frog within the study area. Due to the abundance of aquatic habitat in the moderate to high elevations of the study area the associated upland refugia and dispersal habitat is quite expansive. The known occurrences of this species fall within the modeled habitat.

## Literature Cited

### Printed References

- Bulger, J. 1998. *Wet Season Dispersal and Habitat Use by Juvenile California Red-Legged Frogs (Rana aurora draytonii) in Forest and Rangeland Habitat for the Santa Cruz Mountains*. Research proposal submitted to the U.S. Fish and Wildlife Service. Sacramento, CA.
- Bulger, J.B., N.J. Scott Jr., and R.B. Seymour. 2003. Terrestrial Activity and Conservation of Adult California Red-Legged Frogs (*Rana aurora draytonii*) in Coastal Forests and Grasslands. *Biological Conservation* 110:85–95.
- California Natural Diversity Data Base. 2006. Occurrence report for *Rana aurora draytonii*. RareFind, Version 3.0.5 (September 30, 2005 update). Sacramento, CA: California Department of Fish and Game.
- Davidson, C., H.B. Shaffer, and M.R. Jennings. 2001. Declines of the California Red-Legged Frog: Climate, UV-B, Habitat, and Pesticides Hypotheses. *Ecological Applications* 11(2):464–479.
- Fitch, H.S. 1940. A Biogeographical Study of the Ordinoides Artenkreis of Garter Snakes (genus *Thamnophis*): University of California Publication. *Zoology* 44(1):1–150.
- Fox, W. 1952. Notes on Feeding Habits of Pacific Coast Garter Snakes. *Herpetologica* 8(1):4–8.
- Hayes, M.P. and M.R. Jennings. 1986. Decline of Ranid Frog Species in Western North America: Are Bullfrogs (*Rana catesbeiana*) Responsible? *Journal of Herpetology* 20(4):490–509.
- Hayes, M.P. and M.R. Jennings. 1989. Habitat Correlates of Distribution of the California Red-Legged Frog (*Rana aurora draytonii*) and the Foothill Yellow-Legged Frog (*Rana boylei*): Implications for Management. Pages 144–158 in R.E. Szaro, K.E. Severson, and D.R. Patton (technical coordinators). *Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America*. U.S. Department of Agriculture, Forest Service General Technical Report RM-166.
- Hayes, M.P., and D.M. Krempels. 1986. Vocal Sac Variation among Frogs of the Genus *Rana* from Western North America. *Copeia* 1986 4:927–936.
- Hayes, M.P. and M.R. Tennant. 1985. Diet and Feeding Behavior of the California Red-Legged Frog *Rana aurora draytonii* (Ranidae). *The Southwestern Naturalist* 30(4):601–605.



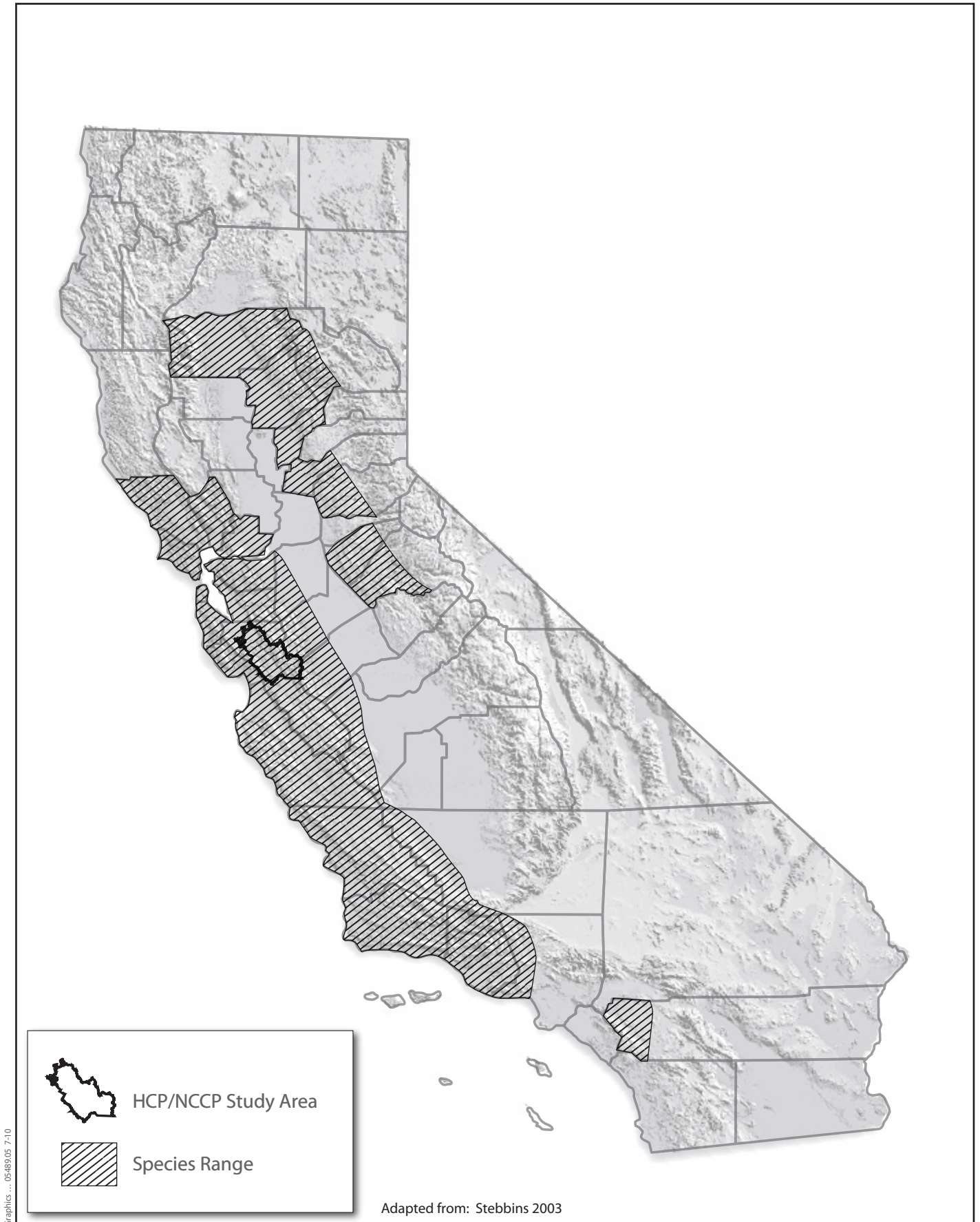
- H.T. Harvey and Associates. 1997. *Red-Legged Frog Distribution and Status – 1997*. Prepared for Santa Clara Valley Water District, CA.
- Jennings, M.R. and M.P. Hayes. 1985. Pre-1900 Overharvest of California Red-Legged Frogs (*Rana aurora draytonii*): The Inducement for Bullfrog (*Rana catesbeiana*) Introduction. *Herpetological Review* 32(1):94–103.
- . 1990. *Report on the Status of the California Red-Legged Frog (Rana aurora draytonii) in the Pescadero Marsh Natural Preserve*. (Final.) Prepared for the California Department of Parks and Recreation under contract No. 4-823-9018 with the California Academy of Sciences.
- . 1994. *Amphibian and Reptile Species of Special Concern in California*. Prepared for the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.
- Jennings, M.R., M.P. Hayes, and D.C. Holland. 1992. A Petition to the U.S. Fish and Wildlife Service to Place the California Red-Legged Frog (*Rana aurora draytonii*) and the Western Pond Turtle (*Clemmys marmorata*) on the List of Endangered and Threatened Wildlife and Plants. 21 pages.
- Lawler, S.P., D. Dritz, Strange, and M. Holyoak. 1999. Effects of introduced mosquitofish and bullfrogs on the threatened California red-legged frog. *Conservation Biology* 13:613–622.
- Licht, L.E. 1974. Survival of Embryos, Tadpoles, and Adults of the Frogs *Rana aurora aurora* and *Rana pretiosa pretiosa sympatric* in Southwestern British Columbia. *Canadian Journal of Zoology* 52(5):613–627.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: April 20, 2006.
- Rathbun, G.B., M.R. Jennings, T.G. Murphy, and N.R. Siepel. 1993. *Status and Ecology of Sensitive Aquatic Vertebrates in Lower San Simeon and Pico Creeks, San Luis Obispo County, California*. Page 103. San Simeon, CA: U.S. Fish and Wildlife Service, National Ecology Research Center. Prepared for the California Department of Parks and Recreation.
- Rathbun, G.B. and T.G. Murphy. 1996. Evaluation of a Radio-Belt for Ranid Frogs. *Herpetological Review* 27(4):197–189.
- Soulé, M. 1998. *Viable Populations for Conservation*. Great Britain: Cambridge University Press.
- Shaffer, H.B., G.M. Fellers, S.R. Voss, J.C. Oliver, and G.B. Pauly. 2004. Species boundaries, phylogeography and conservation genetics of the red-legged frog (*Rana aurora draytonii*) complex. *Molecular Ecology*. 13:2667–2677.

- Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians*. Boston, MA: Houghton Mifflin Company.
- Storer, T.I. 1925. A Synopsis of the Amphibia of California: University of California Publications. *Zoology* 27:1–342.
- U.S. Fish and Wildlife Service. 1996. *Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the California Red-Legged Frog*. 61(110) FR 25813–25833 (May 23).
- . 2002. *Recovery Plan for the California Red-Legged Frog* (*Rana aurora draytonii*). Pages viii and 173. Portland, OR: U.S. Fish and Wildlife Service.
- . 2005. *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog*. Available: <<http://www.fws.gov>>. Accessed: March 23, 2006.
- . 2006. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the California Red-Legged Frog and and Special Rule Exemption Associated With Final Listing for Existing Routine Ranching Activities, Final Rule. Federal Register 71(71):19244–19346. April 13.
- . 2010. Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for the California Red-Legged Frog, Final Rule. Federal Register 75(51):12816–12959. March 17.
- Wright, A.H. and A.A. Wright. 1949. *Handbook of Frogs and Toads of the United States and Canada*. Ithaca, N.Y: Comstock Publishing Company.

## Personal Communications

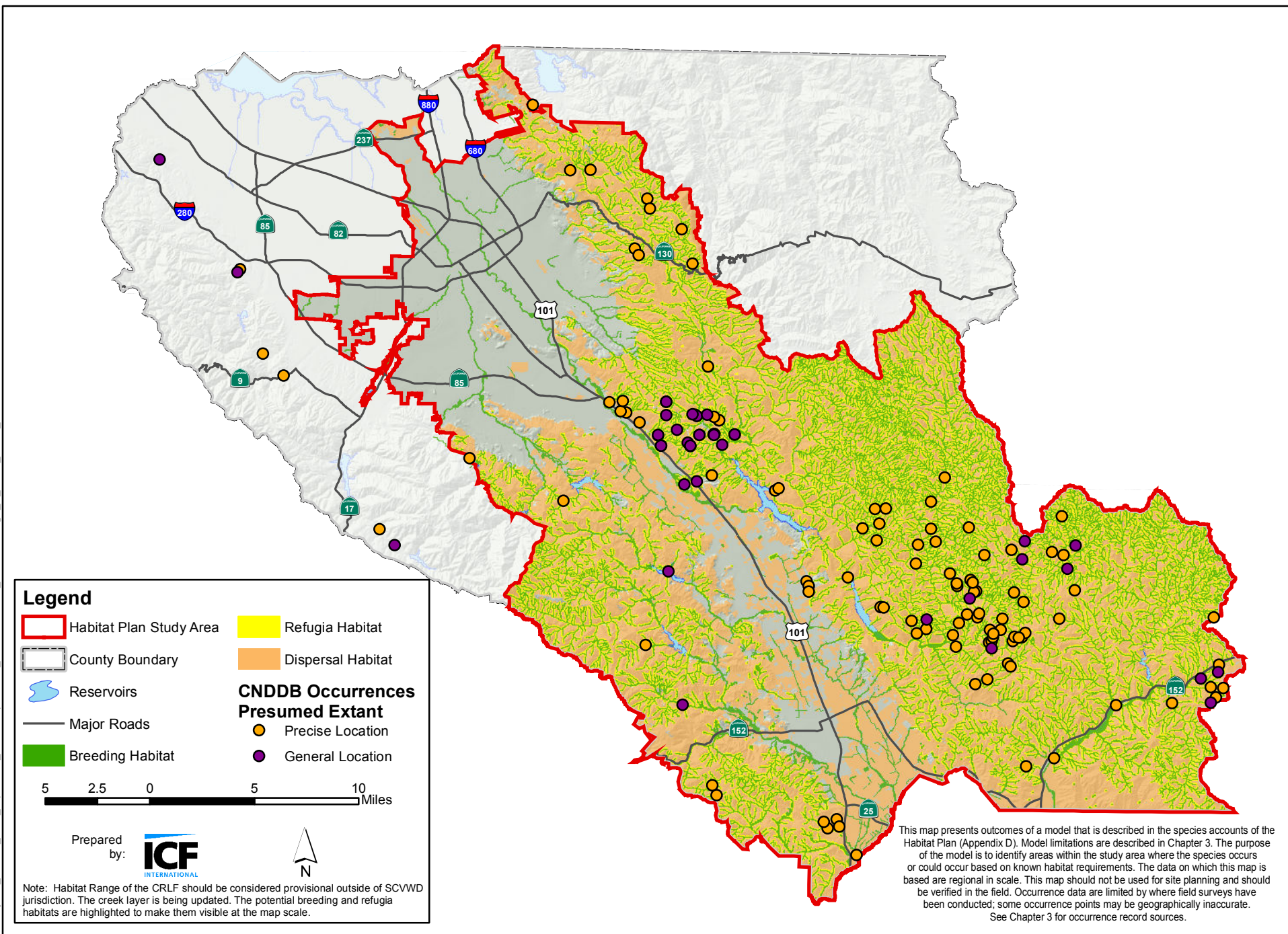
- Breckling, B. Park Ranger, Henry W. Coe State Park, California Department of Parks and Recreation. May 25, 2006. Meeting with David Zippin.
- Hogan, J. Biologist. California Department of Fish and Game. Email correspondence between Jennifer Hogan and Russell Smith regarding California red-legged frog distribution in southern California. Correspondence forwarded to Troy Rahmig (Jones & Stokes) along with comments on draft Santa Clara Valley HCP/NCCP—California red-legged frog species account.
- Padley, W. D. Biologist with Ecological Services Unit, Watershed Management Operations, Santa Clara Valley Water District. March 13, 2006. Telephone conversation with Stephanie Myers.





**Figure 1**  
**California Red-Legged Frog (*Rana aurora draytonii*)**  
**Distribution in California**





**Figure 2**  
**California Red-legged Frog Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Foothill Yellow-legged Frog (*Rana boylei*)

### Legal Status

**State:** Species of Special Concern

**Federal:** None

**Critical Habitat:** None

**Recovery Planning:** None



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### Taxonomy

Mitochondrial DNA data suggest that *Rana aurora*, *R. cascadae*, and *R. muscosa* form a clade within the *R. boylei* species group (Macey et al. 2001). Descriptions of the species' physical characteristics can be found in Stebbins 2003.

### Distribution

#### General

Historically, foothill yellow-legged frogs occurred from west of the crest of the Cascade mountains in Oregon south to the Transverse ranges in Los Angeles County, and in the Sierra Nevada foothills south to Kern County (Zweifel 1955; Stebbins 2003). The known elevation range of the species extends from near sea level to approximately 2,040 meters (6,700 feet) above sea level (Stebbins 2003). The current range excludes coastal areas south of northern San Luis Obispo County and foothill areas south of Fresno County, where the species is apparently extirpated (Jennings and Hayes 1994) (Figure 1). The foothill yellow-legged frog is still common along the north coast of California (G. Fellers cited by Stebbins and Cohen 1995). Fellers (1994) reported healthy, reproducing populations throughout suitable habitat in the Diablo Range in Alameda, western Stanislaus, Santa Clara, San Benito, and western Fresno counties.

### Occurrences within the Study Area

#### Historical

Historically, foothill yellow-legged frogs were probably present in virtually all of the larger perennial streams in Santa Clara County with the exceptions of the lower portions of Coyote Creek and Guadalupe River (H.T. Harvey and Associates 1999). There are no CNDDDB records for foothill yellow-legged frogs

prior to 1990. The lack of CNDDDB data could be explained by the fact that the California Department of Fish and Game did not require surveyors to submit survey results before 1995 (California Natural Diversity Database 2006).

## Recent

In 1999, H.T. Harvey and Associates summarized the distribution status of the foothill yellow-legged frog for the Santa Clara Valley Water District (H.T. Harvey and Associates 1999). They concluded that, based on their analysis of known locality records, the species had essentially disappeared from the farmed and urbanized lowland areas of the county, as well as many of the perennial streams below major reservoirs. It was determined that though the species is declining throughout Santa Clara County they are still present in the Santa Cruz Mountains and fairly abundant in the foothill and mountain ranges of eastern Santa Clara County (H.T. Harvey and Associates 1999). The extant occurrences as reported by H.T. Harvey and Associates (1999) are captured in the occurrence records for Figure 2.

This species has been found in most perennial streams and rivers in the study area, particularly in the upper reaches. There are several records from the upper reaches of Coyote Creek along with records from nearly all of the streams in the Pajaro River watershed. According to the California Natural Diversity Database (2006), there are nine extant occurrence records of foothill yellow-legged frog in the study area. Seven of the occurrences are on the east side of the valley the northern most of which is in Penetencia Creek. The others are in the Santa Cruz Mountains west of Gilroy.

## Natural History

### Habitat Requirements

Foothill yellow-legged frogs require shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate (Hayes and Jennings 1988; Jennings 1988; Bourque 2008). This habitat is believed to favor oviposition (Storer 1925; Fitch 1936; Zweifel 1955) and refuge habitat for larvae and postmetamorphs (Hayes and Jennings 1988; Jennings 1988). This species has been found in streams without cobble (Fitch 1938; Zweifel 1955), but it is not clear whether these habitats are regularly used (Hayes and Jennings 1988; Jennings and Hayes 1994). Foothill yellow-legged frogs are usually absent from habitats where introduced aquatic predators, such as various fishes and bullfrogs, are present (Hayes and Jennings 1986, 1988; Kupferberg 1994). Typical breeding and egg deposition occurs in stream habitat that has little to no slope (U.S. Forest Service 2011). The species deposits its egg masses on the downstream side of cobbles and boulders over which a relatively thin, gentle flow of water exists (Storer 1925; Fitch 1936; Zweifel 1955; Kupferberg 1996). The timing of oviposition typically follows the period of high-flow discharge from winter rainfall and snowmelt (Jennings and Hayes 1994; Kupferberg 1996).

The embryos have a critical thermal maximum temperature of 26°C (Zweifel 1955).

**Table 1.** Habitat Associations for Foothill Yellow-Legged Frog

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Riparian Woodland	Movement	Primary	Unknown	Nussbaum et al. 1983
Riparian Scrub	Movement	Primary	Unknown	Nussbaum et al. 1983
Aquatic	Breeding	Primary	All life stages occur at aquatic sites	Ibis Environmental Inc. 2003; Morey 2005; U.S. Forest Service 2011

## Reproduction

Foothill yellow-legged frogs in California generally breed between March and early June (Storer 1925; Grinnell et al. 1930; Wright and Wright 1949; Jennings and Hayes 1994). Masses of eggs are deposited on the downstream side of cobbles and boulders. After oviposition, a minimum of approximately fifteen weeks is required to reach metamorphosis, which typically occurs between July and September (Storer 1925; Jennings 1988). Larvae attain adult size in two years (Storer 1925). In a study on the Eel River along the northern coast of California, foothill yellow-legged frog chose sites to lay eggs and timed egg laying to avoid fluctuations in river stage and current velocity associated with changes in river discharge (Kupferberg 1996). This suggests that stable flow and current velocities are important to create suitable reproductive sites for foothill yellow-legged frogs.

**Table 2.** Key Seasonal Periods for Foothill Yellow-legged Frog

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding			✓	✓	✓	✓						
Metamorphosis							✓	✓	✓			
Dispersal (metamorphosis)								✓	✓	✓		

Sources: Ibis Environmental, Inc. 2003; Twitty et al 1967.

## Movement

Foothill yellow-legged frogs are a highly aquatic amphibian, spending most or all of their life in or near streams, though frogs have been documented underground and beneath surface objects more than 50 meters (165 feet) from water (Nussbaum et al. 1983). Bourque (2008) reported the movements of radio-tracked frogs being restricted to watercourse, though movement distances were



considerably longer than previously reported with mark recapture techniques. Bourque (2008) found that radio-tagged frogs were relocated on land adjacent to water 37.7% (males) and 65.6% (females). Average distance from water was <3 meters with a range from 6.9–40 meters (Bourque 2008). Distance moved from perennial, ephemeral and intermittent streams was similar. During the breeding season, from March through June, adults and subadults may move several hundred meters or more to congregate at breeding sites (Ibis Environmental, Inc. 2003). Bourque (2008) documented movements up to 578 meters (males) and 7,043 meters (females) during the breeding season. Adult male foothill yellow-legged frogs have high site fidelity during the breeding season and typically occupy small home ranges near breeding site (Bourque 2008).

**Table 3.** Movement Distances for Foothill Yellow-legged Frog

Type	Distance/Area	Location of Study	Citation
Breeding	300 m +	Unknown	Ibis Environmental, Inc. 2003
	578 m (males)	Tehama County, CA	Bourque 2008
	7,043 m (females), median = 525 m	Tehama County, CA	Bourque 2008
Non-breeding	155 feet	Pacific Northwest	Nussbaum et al. 1983

## Ecological Relationships

Garter snakes are considered one of the most prominent predators of foothill yellow-legged frog tadpoles (Fitch 1941; Zweifel 1955; Lind 1990; Jennings and Hayes 1994). Salamanders, including the rough-skinned newt (*Taricha tarosa*), are believed to prey on the species' eggs. The foothill yellow-legged frog coexists with the California red-legged frog (*Rana aurora draytonii*) at some localities, but different microhabitat preferences probably diminish competition (California Wildlife Habitat Relationships System 2005).

## Population Status and Trends

**Global:** Declining (NatureServe 2006)

**State:** Declining (Jennings and Hayes 1994)

**Within Study Area:** Declining (H.T. Harvey and Associates 1999)

## Threats

Habitat loss and degradation, introduction of exotic predators, and toxic chemicals (including pesticides) pose continued and increasing threats to the long-term viability of amphibians throughout California (Jennings and Hayes

1994). In addition, poorly timed water releases from upstream reservoirs can scour egg masses of this species from their oviposition substrates (Jennings and Hayes 1994; Lind 2005; Kupferberg 2009), and decreased flows can force adult frogs to move into permanent pools, where they may be more susceptible to predation (Hayes and Jennings 1988)

Threats include stream scouring (which may negatively impact frogs in streambed hibernation sites), introduced incompatible aquatic animals, riverine and riparian impacts of nonselective logging practices, and stabilization of historically fluctuating stream flows. See Lind et al. (1996), Lind (2005) and Kupferberg et al. (2009) for information on the association of population decline in watershed with dams.

Davidson et al. (2002) found evidence that airborne agrochemicals have played a significant role in the decline of this species; habitat destruction, climate change, and UV-B radiation also appeared to be contributing factors. Lind (2005) further linked changes in land use and use of air-borne toxins on the absence of foothill yellow-legged frogs in areas where they had been previously documented.

Kupferberg (1997) found that bullfrog larvae perturbed aquatic community structure and exerted detrimental effects on *Rana boylei* populations in northern California but had only a slight impact on *Pseudacris regilla*. Interspecific matings between male *R. boylei* and female bullfrogs have been observed; these interactions with nonnative bullfrogs might reduce the reproductive output of *R. boylei* (Lind et al. 2003). Centrarchid fishes readily eat *Rana* eggs (Werschkul and Christensen 1977), and where introduced into foothill streams, may also contribute to the elimination of foothill yellow-legged frogs (Morey 2005).

## Data Characterization

Because the California Department of Fish and Game did not require surveyors to submit survey results before 1995, any recorded occurrences before that time have gone undocumented (California Natural Diversity Database 2006). Few areas within the study area have been surveyed for this species, and several of the observations are incidental. Relatively few areas have been adequately surveyed because of the difficulty of access to private lands within the county (H.T. Harvey and Associates 1999). For this reason a more conservative approach was taken when modeling habitat for this species.

## Existing Conservation Actions in the Study Area

There are no conservation efforts within the study area that directly target the recovery of this species. However, stream restoration projects that return creeks and streams to natural flow regimes will benefit this species.

## Modeled Species Distribution in Study Area

### Model Description

#### Model Assumptions

##### Primary Habitat—Breeding and Foraging

Low gradient streams (0 to 4% slope) or rivers not regulated by a dam, in riparian forest/scrub, grassland, oak woodland, and conifer woodland land cover types.

##### Secondary Habitat—Low Use Habitat

Moderate gradient streams (4% to 10% slope) or rivers in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types.

#### Rationale

Foothill yellow-legged frogs are stream-dwelling amphibians that require shallow, flowing water in small to moderate-sized perennial streams, typically with low gradients (U.S. Forest Service 2011), with at least some cobble-sized substrate (Hayes and Jennings 1988; Jennings 1988; H.T. Harvey and Associates 1999). This species has also been found in perennial streams without cobble (Fitch 1938; Zweifel 1955) and has been documented using intermittent and ephemeral stream during fall/winter (Bourque 2008), but it is not clear whether these habitats are regularly used in Santa Clara County (Hayes and Jennings 1988; Jennings and Hayes 1994; H.T. Harvey and Associates 1999). By including all stream types in the model we compensate for under-surveyed areas. Although secondary habitat (moderate gradient streams or rivers) may not support the species and likely have fewer conservation opportunities for this species, those areas were retained in the model output because occurrences have been documented in such habitat.

### Model Results

Figure 2 shows the modeled potential habitat of the foothill yellow-legged frog within the study area. Primary habitat appears to be present in portions of stream habitats with low gradients that are more likely to be perennial. Secondary habitat includes moderate gradient streams. The known occurrences in the study area fall within the modeled habitat, including in many foothill streams near areas of primary habitat.

### Literature Cited

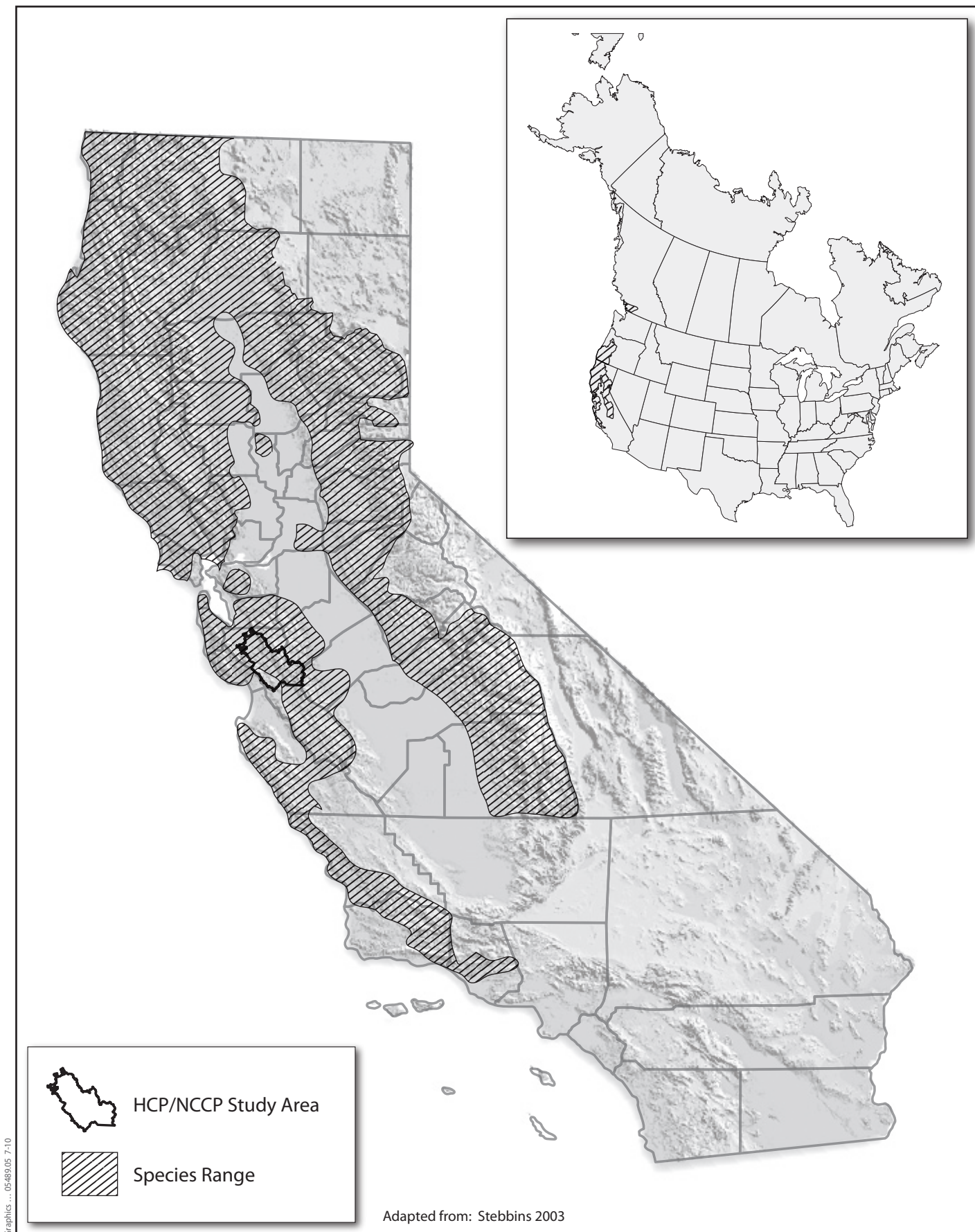
Bourque, R.M. 2008. Spatial Ecology of an Inland Population of the Foothill Yellow-legged Frog (*Rana boylei*) in Tehama County, California. Master's Thesis. Humboldt State University.

- California Natural Diversity Data Base. 2006. Occurrence report for *Rana boylei*. RareFind, Version 3.0.5 (March 30, 2005 update). Sacramento, CA: California Department of Fish and Game.
- Davidson, C., H.B. Shaffer, and M.R. Jennings. 2002. Spatial test of pesticide drift, habitat destruction, UV-B, and climate-change hypotheses for California amphibian declines. *Conservation Biology* 16: 1588–1601.
- Fellers, G.M., editor. 1994. California/Nevada declining amphibian working group. Newsletter 1, 1 May 1994. 10 pp.
- Fitch, H.S. 1936. Amphibians and Reptiles of the Rogue River Basin, Oregon. *American Midland Naturalist* 17(3):634–652.
- . 1938. *Rana boylei* in Oregon. *Copeia* 1938(3):148.
- . 1941. The Feeding Habits of California Garter Snakes. *California Fish and Game* 27(2):1-32
- Grinnell, J., J. Dixon, and J.M. Linsdale. 1930. Vertebrate Natural History of a Section of Northern California through the Lassen Park Region: University of California Publications. *Zoology* 35:1–594.
- H.T. Harvey and Associates. 1999. *Santa Clara Valley Water District Foothill Yellow-Legged Frog Distribution and Status-1999*. Prepared for Santa Clara Valley Water District, San José, CA.
- Hayes, M.P. and M.R. Jennings. 1986. Decline of Ranid Frog Species in Western North America: Are Bullfrogs (*Rana catesbeiana*) Responsible? *Journal of Herpetology* 20(4):490–509.
- . 1988. Habitat Correlates of Distribution of the California Red-Legged Frog (*Rana aurora draytonii*) and the Foothill Yellow-Legged Frog (*Rana boylei*): Implications for Management. Pages 144–158 in R.C. Szaro, K.E. Severson, and D.R. Patton (technical coordinators), *Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America*. (General Technical Report RM-166.) U.S. Department of Agriculture, Forest Service.
- Ibis Environmental, Inc. 2003. *Draft Results of 2002 Surveys for Foothill Yellow-Legged Frog (Rana boylei) in the Mokelumne River Project Area*. (January 2003). Prepared for Pacific Gas and Electric Company, San Ramon, CA.
- Jennings, M.R. 1988. Natural History and Decline of Native Ranids in California. Pages 61–72 in H.F. DeLisle, P.R. Brown, B. Kaufman, and B.M. McGurty (editors), *Proceedings of the Conference on California Herpetology*. Southwestern Herpetologists Society, Special Publication (4).

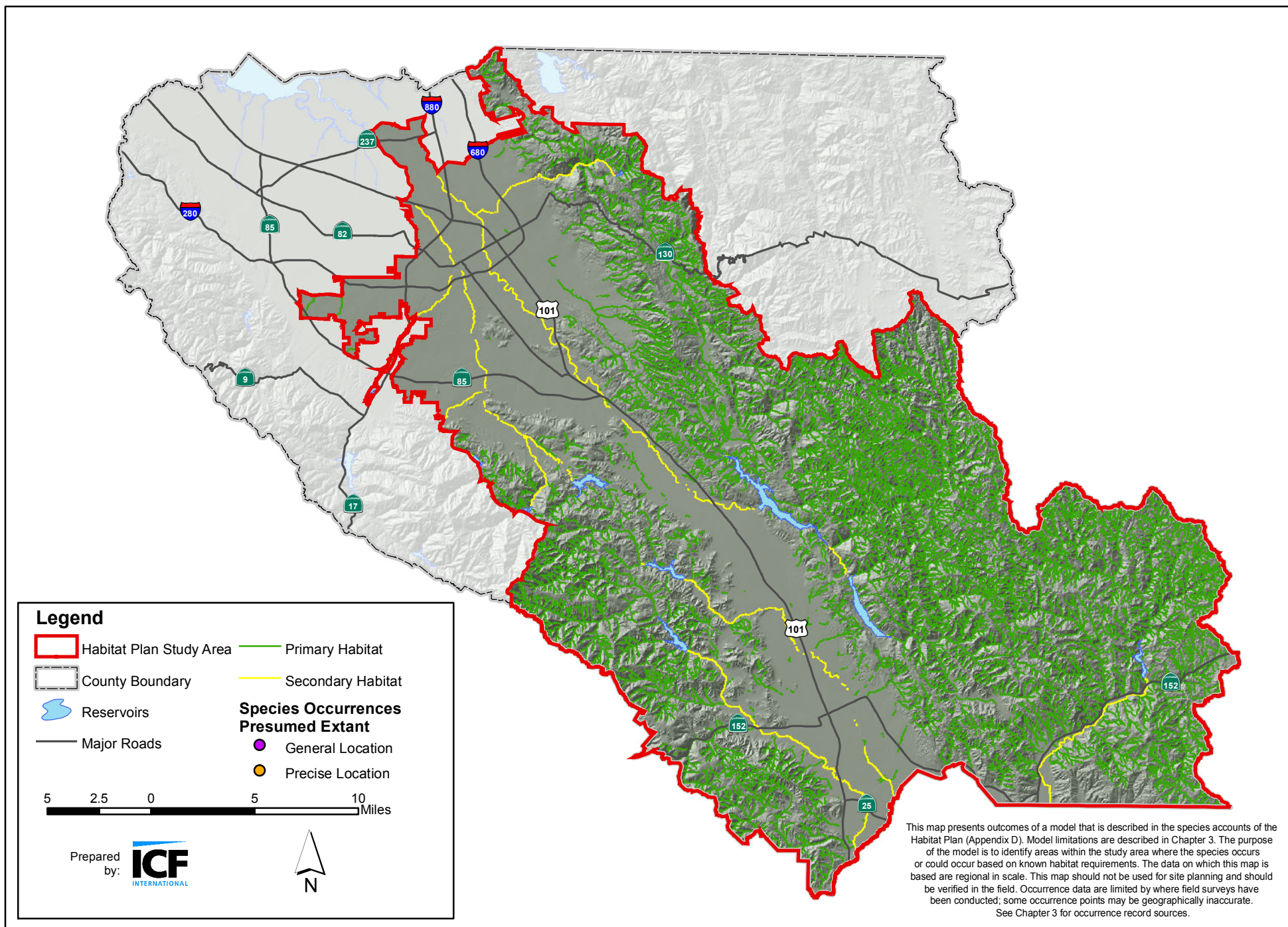
- Jennings, M.R. and M.P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. (Final Report.) (Contract 8023.) Prepared for California Department of Fish and Game, Rancho Cordova, CA.
- Kupferberg, S.J. 1994. Exotic Larval Bullfrogs (*Rana catesbeiana*) as Prey for Native Garter Snakes: Functional and Conservation Implications. *Herpetological Review* 25(3):95–97.
- Kupferberg, S.J. 1996. Hydrologic and geomorphic factors affecting conservation of a river-breeding frog (*Rana boylei*). *Ecological Applications* 6:1332–1344.
- Kupferberg, S.J. 1997. Bullfrog (*Rana catesbeiana*) invasion of a California river: the role of larval competition. *Ecology* 78:1736–1751.
- Kupferberg, S., Lind, A.J., and Palen, W. J. 2009. *Pulsed Flow Effects on the Foothill Yellow-Legged Frog (Rana boylei): Population Modeling*. Final Report. California Energy Commission, PIER Program. Publication number TBD.
- Lind, A.J. 1990. *Ontogenetic Changes in the Foraging Behavior, Habitat Use and Food Habits of the Western Aquatic Garter Snakes, Thamnophis couchii, at Hurdygurdy Creek, Del Norte County, California*. MA thesis. Humboldt State University. Arcata, CA.
- Lind, A.J. 2005. Reintroduction of a Declining Amphibian: Determining and Ecologically Feasible Approach for the Foothill Yellow-legged Frog (*Rana Boylei*) Through Analysis o Decline Factors, Genetic Structure, and Habitat Associations. PhD Dissertation, University of California-Davis.
- Lind, A.J., H.H. Welsh, Jr., and R.A. Wilson. 1996. The effects of a dam on breeding habitat and egg survival of the foothill yellow-legged frog (*Rana boylei*) in northwestern California. *Herpetological Review* 27:62–67.
- Macey, J.R., J.L. Strasburg, J.A. Brisson, V.T. Vredenburg, M. Jennings, and A. Larson. 2001. Molecular phylogenetics of western North American frogs of the *Rana boylei* species group. *Molecular Phylogenetics and Evolution* 19:131–143.
- Morey, S. 2005. *Foothill Yellow-Legged Frog (Rana boylei)*. California Wildlife Habitat Relationships System, California Department of Fish and Game, California Interagency Wildlife Task Group. Available: <[www.dfg.ca.gov/whdab/html/A043.html](http://www.dfg.ca.gov/whdab/html/A043.html)>. Accessed: January 5, 2005.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: April 21, 2006.
- Nussbaum, R.A., E.D. Brodie, Jr, and R.M. Storm. 1983. *Amphibians and Reptiles of the Pacific Northwest*. University Press of Idaho.

- Stebbins, R. C. 2003. *A Field Guide to Western Reptiles and Amphibians*. New York, NY: Houghton Mifflin Company.
- Stebbins, R.C. and N.W. Cohen. 1995. *A Natural History of Amphibians*. Princeton University Press, Princeton, New Jersey.
- Storer. 1925. A Synopsis of the Amphibia of California: University of California Publications. *Zoology* 27:1–342.
- U.S. Forest Service. 2011. Pacific Southwest Research Station Research Topics: Wildlife & Fish- Foothill Yellow-legged Frog (*Rana boylei*). Accessed: April 16, 2011. Available at: [http://www.fs.fed.us/psw/topics/wildlife/herp/rana\\_boylei/ecology.shtml#Egg sLarvae](http://www.fs.fed.us/psw/topics/wildlife/herp/rana_boylei/ecology.shtml#Egg sLarvae)
- Werschkul, D.F. and M.T. Christensen. 1977. Differential predation by *Lepomis macrochirus* on eggs and tadpoles of *Rana*. *Herpetologica* 33:237–241.
- Wright, A.H. and A.A. Wright. 1949. *Handbook of Frogs and Toads of the United States and Canada*. (Third Edition). Ithaca, NY: Comstock Publishing Company.
- Zweifel, R.G. 1955. Ecology, Distribution, and Systematics of Frogs of the *Rana boylei* Group: University of California Publications. *Zoology* 54(4):207–292.









**Figure 2**  
**Foothill Yellow-Legged Frog Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Western Pond Turtle (*Clemmys marmorata*)

### Legal Status

**State:** Species of Special Concern; meets requirements as a rare, threatened, or endangered species under the California Environmental Quality Act (CEQA)  
**Federal:** None  
**Critical Habitat:** N/A  
**Recovery Planning:** N/A



### Taxonomy

Western pond turtle is the only species in its genus that occurs in the western United States. This species occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada Range but in greatly reduced numbers (Jennings and Hayes 1994). There are two recognized subspecies: the northwestern pond turtle (*Clemmys marmorata marmorata*) and the southwestern pond turtle (*Clemmys marmorata pallida*). Genetic research supports the distinctiveness of the two subspecies (Gray 1995; Janzen et al. 1997). The taxonomy is currently under review. A summary of this is outlined by NatureServe (2006). Descriptions of the species' physical characteristics can be found in Stebbins (2003).

### Distribution

#### General

Historically, the western pond turtle had a relatively continuous distribution in most Pacific slope drainages from Klickitat County, Washington, along the Columbia River (Slater 1962) to Arroyo Santo Domingo, northern Baja California, Mexico. In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders (Jones & Stokes 2004). The area of the Central Valley of California between the American River drainage and the Transverse Ranges is considered a zone of intergradation between the two subspecies (Seeliger 1945; U.S. Fish and Wildlife Service 1999) (Figure 1).

## Occurrences within the Study Area

### Historical

There are 53 documented occurrences within the study area (California Natural Diversity Database 2006). Of those 53, only 3 were documented before 1985. Though this species is thought to be historically abundant within the study area, there is little information to justify this claim. The fact that the species persists in highly altered aquatic habitat (e.g., channelized waterways and reservoirs) lends support to the idea that it was more abundant when these habitats were in a more natural state.

### Recent

There are 50 known recent occurrences of this species within the study area (California Natural Diversity Database 2006). All of these occurrences were assumed to be extant at the time of documentation. Nearly all were recorded with fair to excellent confidence, leaving only one with poor confidence and seven with unknown confidence. The majority (37) of the occurrences were recorded in the southern half of Santa Clara County. Most are associated with reservoirs or creeks (namely Uvas and Llagas Creeks) as they enter reservoirs. The occurrence data may be bias in favor of areas where observers are likely to make incidental observations (reservoirs, Henry W. Coe State Park, and other park facilities). Western pond turtles have been documented throughout the Coyote Creek drainage from the upper reaches in Henry W. Coe State Park to the urbanized reaches in San José (California Natural Diversity Database 2006).

## Natural History

### Habitat Requirements

Western pond turtles occur in a variety of aquatic habitats from sea level to elevations of 6,500 feet. They are found in rivers, streams, lakes, ponds, wetlands, reservoirs, and brackish estuarine waters (Holland 1994; Jennings and Hayes 1994). Western pond turtles use aquatic habitats primarily for foraging, thermoregulation, and avoidance of predators. They prefer habitats with large areas for cover (such as logs, algae, and vegetation) and basking sites (such as boulders or other substrates). The species has been observed to avoid areas of open water lacking these habitat features (Holland 1994). Both adult and juvenile turtles favor aquatic habitats with access to areas of deep, slow water with underwater refugia. Hatchlings are relatively poor swimmers and tend to seek areas with shallow, warm water, free of predatory aquatic vertebrates, with at least some aquatic vegetation (Reese 1996; Holland 1994; Jones & Stokes 2004).

Western pond turtles overwinter in both aquatic and terrestrial habitats. Aquatic refugia consist of rocks, logs, mud, submerged vegetation, and undercut areas

along banks. Terrestrial overwintering habitat consists of burrows in leaf litter or soil. The presence of a duff layer seems to be a general characteristic of overwintering habitat (Jones & Stokes 2004; Holland 1994; Davis 1998).

**Table 1.** Land Cover Type Associations for Western Pond Turtle

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Wetlands	Foraging, thermoregulation, refuge	Primary	Cover and basking sites	Holland 1994
Aquatic	Foraging, thermoregulation, refuge	Primary	Cover and basking sites	Holland 1994
Shrub dominated	Nesting	Primary	Sunny and relatively undisturbed	Rathbun et al. 2002; Jennings and Hayes 1994
Herbaceous dominated	Nesting	Primary	Sunny and relatively undisturbed; some grazing is tolerated	Rathbun et al. 2002; Jennings and Hayes 1994
Riparian woodland	Refugia, thermoregulation	Secondary	Well developed riparian corridor protects aquatic habitats	Holland 1994; Jennings and Hayes 1994
Riparian scrub	Refugia, thermoregulation	Secondary	Well developed riparian corridor protects aquatic habitats	Holland 1994; Jennings and Hayes 1994

## Reproduction

Western pond turtles first breed at 10 to 14 years of age (U.S. Fish and Wildlife Service 1999; Stebbins 2003). Most females lay eggs in alternate years. Clutch size ranges from 1 to 13 eggs, with larger females generally laying larger clutches (Holland 1985a, 1991a). Gravid females leave drying creeks from May through July to deposit their eggs in sunny, upland habitats, including grazed pastures and agricultural fields (Crump 2001). Nesting has been reported to occur up to 402 meters (1,391 feet) from water (Jennings and Hayes 1994) but is usually closer, averaging 28 meters (92 feet) from aquatic habitat (Rathbun et al. 2002). Incubation lasts 80 to 100 days, and the normal hatch success is approximately 70%. Nest predation rates are high, and complete failure of nests is common.

**Table 2.** Key Seasonal Periods for Western Pond Turtle

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nesting					✓	✓	✓					
Movement to nest sites				✓	✓							
Hatching and dispersal							✓	✓	✓			

Sources: Jennings and Hayes 1994; Rathbun et al. 2002; Jones & Stokes 2004.

## Movement

Western pond turtles utilize a home range on the order of several hundred meters (Holland 1994), with males using a larger aquatic home range than females. Individuals may occasionally make sporadic long-distance aquatic movements outside their home range (Holland 1994). Gravid females usually leave the water to nest on land in the late afternoon or evening, returning to the water by morning, although this is quite variable (Crump 2001). Nest sites have been found as far as 400 meters from the water (Reese 1996). Reese (1996) found that over the summer months (May–September), juvenile turtles have an average maximum movement of approximately 84 meters. Their mean weekly aquatic travel is 19.9 meters. Their home range is smaller than that of adults but larger than previously recognized and also includes terrestrial components (Reese 1996). Juveniles sometimes travel back and forth between low-flow portions of the river and adjacent ponds.

**Table 3.** Movement Distances for Western Pond Turtle

Type	Distance/Area	Location of Study	Citation
Home range (aquatic)	>100m from watercourse to upland	Oregon	Holland 1994
Movement to nesting sites from watercourse	Up to 400m	Northern California	Reese 1996
Movement to overwintering sites from home range	~167m	Northern California	Reese 1996

## Ecological Relationships

Western pond turtles are considered dietary generalists, but they do not select food items based on general availability (Bury 1986). This species prefers live prey, which it captures by opportunistic foraging tactics. Individuals will also scavenge carrion and browse on plant material. Prey items are ingested in the water; it appears this species is unable to swallow in air (Holland 1994). Preferred food items include aquatic insect larvae, crustaceans (cladocerans and crayfish), and annelids. Small vertebrates (including *Rana boylii* tadpoles and

egg masses) have been found during gut content analysis of *C. marmorata*, but it is unclear whether these were ingested as prey or carrion (Bury 1986; Holland 1994).

Several common predator prey on western pond turtles. These predators include, but are not limited to raccoon (*Procyon lotor*), coyote (*Canis latrans*), grey fox (*Urocyon cinereoargenteus*), and feral and domestic dogs (*Canis familiaris*) (Holland 1994). Adult turtles often show scarring on the shell and/or missing limbs, indicating attempted predation.

Hatchlings are especially vulnerable to predators because their shell is soft and they can be swallowed whole. Overland movements from the nest site to the aquatic habitat expose turtles to a wide range of terrestrial predators. Holland (1994) found a six-fold greater scarring rate on females and attributed it to greater exposure to predators during nesting movements. Exotic aquatic predators, such as bullfrogs (*Rana catesbeiana*) and largemouth bass (*Micropterus salmoides*), can be especially effective at reducing recruitment in this species when turtles arrive at the preferred aquatic microhabitat after leaving the nest site (Holland 1994).

## Population Status and Trends

**Global:** Declining (Bury 1986; NatureServe 2006)

**State:** Unknown

**Within Study Area:** Unknown

The species is declining throughout its range, more so in Washington and Oregon than in California (NatureServe 2006). The status of the population in California is not well understood but decline is generally attributed to a loss of nesting habitat (see below).

## Threats

Numerous factors, including loss, degradation, and fragmentation of habitat; disease; introduced predators and competitors; and other natural and anthropogenic conditions present ongoing threats to western pond turtles throughout 75–80% of its range (U.S. Fish and Wildlife Service 1999; Holland 1991a).

Recent studies describe populations that have adults but few juveniles, indicating that little or no reproduction is taking place (Jones & Stokes 2004). Because pond turtles are long-lived, non-reproducing populations may persist in isolated wetlands long after recruitment of young has ceased (Holland 1991a; Jennings and Hayes 1994; U.S. Fish and Wildlife Service 1999).



## Data Characterization

Currently, the sizes and densities of western pond turtle populations in California are not well known. Information on dispersal, population structure, population dynamics, and the nature and dynamics of environmental factors affecting populations (including edge effects) is needed to effectively design and implement conservation plans. In addition, the current genetic diversity of existing populations should be investigated to determine metapopulation status, gene flow between populations, and long-term population viability.

## Existing Conservation Actions in the Study Area

There are currently no known conservation actions in the study area that target this species. However, any creek or stream restoration that returns altered aquatic systems to a natural setting will benefit the western pond turtle.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

##### **Primary Habitat—Nest Sites, Basking, Overwintering**

All ponds, streams, canals/ditches, and coastal and valley freshwater marsh are considered primary habitat. In addition, areas within 150 feet of these landcover types are considered suitable nesting and overwintering habitat. There would be an exception to this rule if the landcover within this 150 feet buffer consisted of rock outcrops, vineyards, orchards or urban areas.

##### **Secondary Habitat—Nest Sites and Movement**

Movement habitat includes all land cover types within 1,200 feet of primary habitat with the exception of areas within this buffer that consist of rock outcrops, vineyards, orchards or urban areas.

### Rationale

The western pond turtle is a thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation (Jennings and Hayes 1994). Gravid females oviposit in sunny upland habitats, on grassy banks and in grazed pastures. Nesting has been reported to occur up to 402 meters (1,391 feet) from water (Jennings and Hayes 1994), but is usually closer, averaging 28 meters (92 feet) from aquatic habitat (Rathbun et al. 2002). To accommodate this range but remain conservative, a buffer distance of 150 feet from all aquatic habitat was used to model primary habitat for this species. Nests have been observed in

many soil types, from sandy to very hard. Soil must usually be at least 10 cm (4 in) deep for nesting, and nests must have a relatively high internal humidity for eggs to develop and hatch properly (Zeiner 1988). To account for long-distance dispersal to nest sites or movement between water bodies, the distance of 1,200 feet from all aquatic habitat was used to model habitat suitable for this purpose. Though this is not all inclusive of the documented 1,391 foot dispersal by Jennings and Hayes (1994), it likely still overestimate the actual upland habitat use by this species.

## Model Results

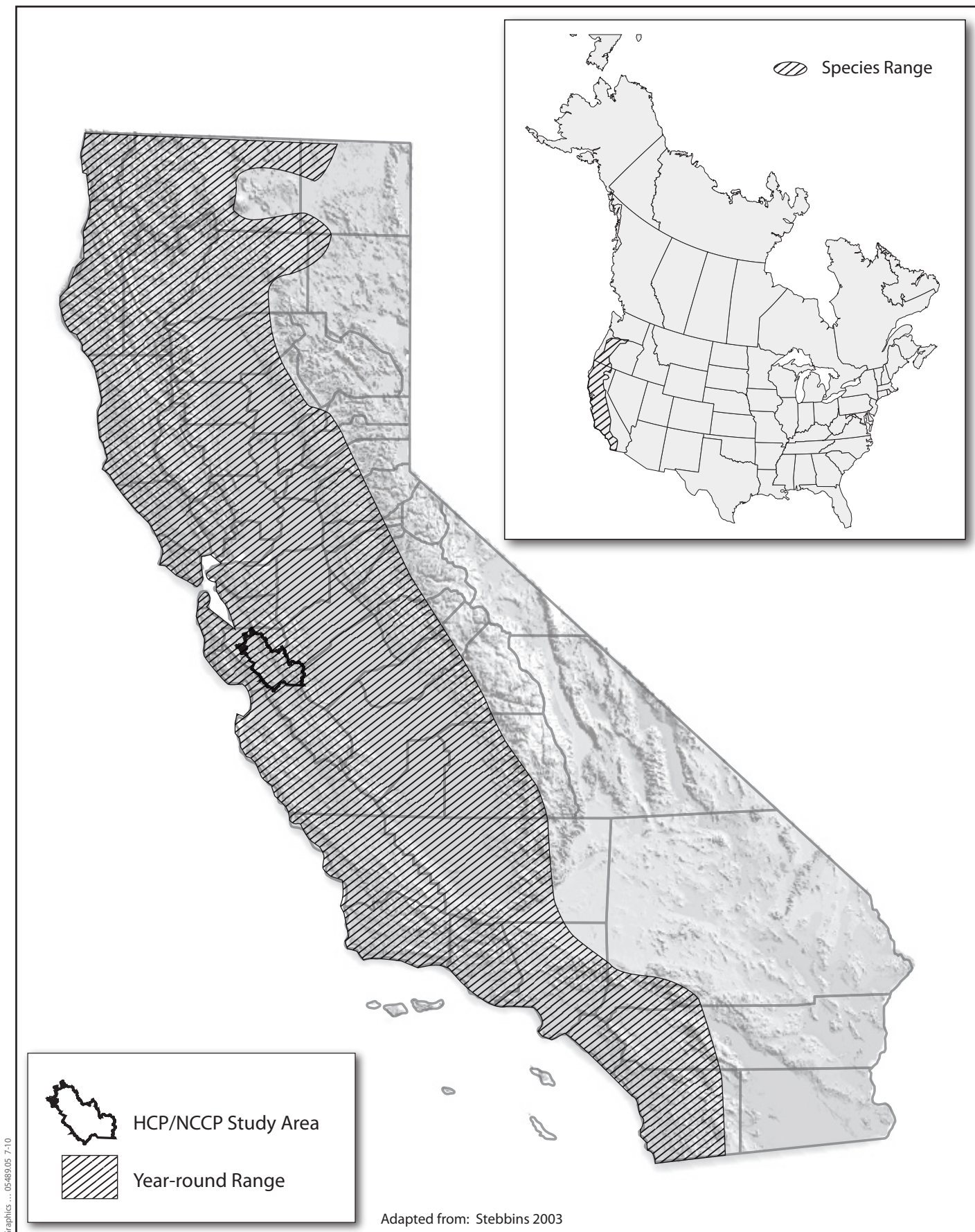
Figure 2 shows the modeled potential habitat of the western pond turtle within the study area. Primary habitat is prevalent in the study area due to the abundance of streams and ponds, particularly in the areas above the valley floor. Movement habitat is found throughout the western and eastern portions of the study area adjacent to streams and ponds. The documented occurrences of western pond turtle in this study area correspond well to locations within the identified suitable habitat and movement corridors.

## Literature Cited

- Bury, R.B. 1986. Feeding Ecology of the Turtle *Clemmys marmorata*. *Journal of Herpetology* 20:515–521.
- California Natural Diversity Database. 2006. Rarefind, Version 3.0.5 (Updated March 31, 2006). Sacramento, CA: California Department of Fish and Game.
- Crump, D.E. 2001. Western Pond Turtle (*Clemmys marmorata pallid*) Nesting Behavior and Habitat Use. Master's Thesis. San José State University, San José, CA. 72 p.
- Davis, C.J. 1998. Western Pond Turtle (*Clemmys marmorata pallid*) Winter Habitat Use and Behavior. Master's thesis. San José State University, San José, CA. 74 p.
- Gray, E.M. 1995. DNA Fingerprinting Reveals a Lack of Genetic Variation in Northern Populations of the Western Pond turtle (*Clemmys marmorata*). *Conservation Biology* 9(5):1244–1254.
- Holland, D.C. 1985a. *An Ecological and Quantitative Study of the Western Pond Turtle (Clemmys marmorata) in San Luis Obispo County, California*. M.S. Thesis. California State University. Fresno, CA.
- . 1991a. *Status and Reproductive Dynamics of a Population of Western Pond Turtles (Clemmys marmorata) in Klickitat County, Washington in*

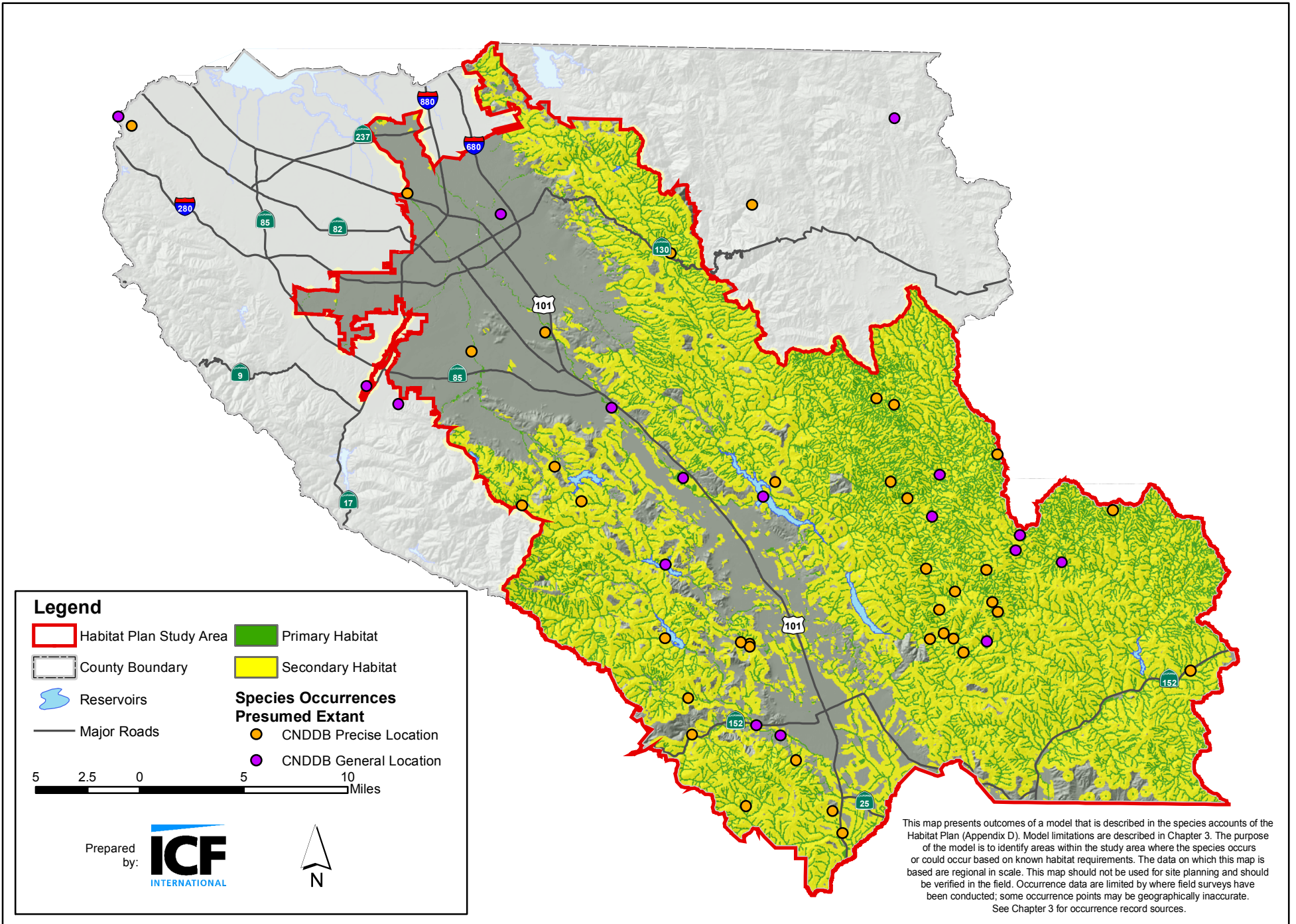


1990. Unpublished report. Olympia, WA: Washington Department of Wildlife.
- . 1994. *The Western Pond Turtle: Habitat and History*. Portland, OR: U.S. Department of Energy, Bonneville Power Administration.
- Janzen, F.J., S.L. Hoover, and H.B. Shaffer. 1997. Molecular Phylogeography of the Western Pond Turtle (*Clemmys marmorata*): Preliminary Results. (Linnaeus Fund Research Report.) *Chelonian Conservation and Biology* 2:623–626.
- Jennings, M.R., and M.P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. Prepared for California Department of Fish and Game, Rancho Cordova, CA.
- Jones & Stokes. 2004. *Western Pond Turtle Habitat Management Plan*. July. (J&S 04254.04.) San José, CA. Prepared for NASA Ames Research Center, Moffet Field, CA.
- NatureServe. 2006. *NatureServe Explorer: An Online Encyclopedia of Life [Web Application]*. (Version 4.6.) Available: <<http://www.natureserve.org/explorer>>. Accessed: March 3, 2006.
- Rathbun, G.B., N.J. Scott, T.G. Murphey. 2002. Terrestrial Habitat Use by Pacific Pond Turtles in a Mediterranean Climate. *Southwestern Naturalist* 47(2):225–235.
- Reese, D.A. 1996. *Comparative Demography and Habitat Use of Western Pond Turtles in Northern California: The Effects of Damming and Related Alterations*. Page 253. Unpublished Ph.D. dissertation. University of California. Berkeley, CA.
- Seeliger, M.L. 1945. Variation in the Pacific Mud Turtle. *Copeia* 1945(3):150–159.
- Slater, J.R. 1962. Variations and New Range of *Clemmys marmorata*. *Occasional papers of the Department of Biology* 20:204–205. Tacoma, WA: University of Puget Sound.
- Stebbins, R.C. 2003. *Peterson Field Guides: Western Reptiles and Amphibians*. (Third Edition.) Pages 249–251. Boston, MA: Houghton Mifflin.
- U.S. Fish and Wildlife Service. 1999. *Draft Recovery Plan for the Giant Garter Snake* (*Thamnophis gigas*). Portland, OR.



**Figure 1**  
**Western Pond Turtle (*Clemmys marmorata*)**  
**Distribution in California**





**Figure 2**  
**Western Pond Turtle Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Western Burrowing Owl (*Athene cunicularia hypugaea*)

### Legal Status

**State:** Bird Species of Special Concern, *Second Priority* (Shuford and Gardali 2008)

**Federal:** Migratory Bird Treaty Act (16 USC 703–712); National Bird of Conservation Concern (U.S. Fish and Wildlife Service 2002)

**Critical Habitat:** N/A

**Recovery Planning:** N/A

**Notes:** The burrowing owl has been included on the list of California Species of Special Concern since 1978 (Remsen 1978; Shuford and Gardali 2008). In 2003 a petition to list the burrowing owl as threatened or endangered under the California Endangered Species Act (Center for Biological Diversity et al. 2003) was rejected by the California Fish and Game Commission (Miller 2007). Another petition could be submitted and the owl's status could change.



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### Taxonomy

Up to 21 subspecies of burrowing owls have been recognized (Clark 1997), but only one subspecies (*Athene cunicularia hypugaea*) occurs in North America west of the Great Plains (Haug et al. 1993). Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (e.g., Peterson 1990; Sibley 2000; National Geographic 2002).

### Distribution and Abundance

#### Distribution

The western burrowing owl is found throughout non-mountainous western North America, from the Great Plains grasslands in southern portions of the western Canadian provinces south through the U.S. into Mexico (Haug et al. 1993). Other burrowing owl subspecies occur in arid, open habitats in Florida, the Caribbean Basin, and South America (Haug et al. 1993; Clark 1997) (Figure 1).

In California, the burrowing owl's range extends throughout the lowlands from the northern Central Valley to Mexico, with a small (perhaps extirpated) population in the Great Basin bioregion in northeast California (Cull and Hall 2007) and the desert regions of southeast California (Gervais et al. 2008). Breeding burrowing owls are absent from the coast north of Sonoma County and

from high mountain areas, such as the Sierra Nevada and the Transverse Ranges extending east from Santa Barbara County to San Bernardino County (Gervais et al. 2008).

A statewide survey of burrowing owl abundance and distribution, exclusive of northeastern California and the eastern deserts, conducted by The Institute for Bird Populations from 1991–1993 (DeSante et al. 2007), showed that the distribution and abundance of burrowing owls in California was not uniform and owl numbers and densities varied considerably among and within the regions surveyed (see below).

Although the overall range of the burrowing owl in California has not drastically changed since summarized by Grinnell and Miller (1944), the species has disappeared as a breeding bird from portions of its former range (Center for Biological Diversity et al. 2003; DeSante et al. 2007; Miller 2007; Gervais et al. 2008). The statewide survey indicated that breeding burrowing owls had disappeared from the central coast (Marin, San Francisco, Santa Cruz, Napa, and coastal San Luis Obispo counties), Ventura County, and the Coachella Valley. At the time of the statewide survey, breeding owls had nearly been extirpated from Sonoma, Santa Barbara, Orange, coastal Monterey and San Mateo counties, where only one to two known breeding pairs remained (DeSante et al. 2007). The listing petition (Center for Biological Diversity et al. 2003; Miller 2007) suggested that breeding burrowing owls have functionally disappeared from 22% of their former range and continue to decline in an additional 23% of their range.

## Abundance

Burrowing owls were first mentioned to be declining in several regions in California as early as the 1940s by Grinnell and Miller (1944) who noted that burrowing owls were becoming scarce in more settled parts of the state due, in some part, to ground squirrel shooting and eradication. All of the available information suggests that burrowing owl populations in several parts of the state declined during the second half of the 20<sup>th</sup> century. The annual Christmas Bird Count records from 1954 to 1986 showed significant owl declines in California, beginning in the 1970s (James and Ethier 1989). Most ornithologists agree that the species has been declining over the past forty years in many parts of the state (Gervais et al. 2008).

DeSante et al. (2007) estimated the state's burrowing owl population at 9,266 pairs with 71% (6571 pairs) of California's burrowing owls (exclusive of northeastern California and the eastern deserts) occurring in the Imperial Valley (which is less than 3% of California) and 24% in the Central Valley. The remaining 5% were in the western part of the state in the San Francisco Bay area, the central coast, and southern California. They also concluded that 92% of the breeding owls in California occurred in lowland areas generally below 200 feet (60 meters) elevation.

The burrowing owl population in the San Francisco Bay area, estimated at 165 breeding pairs in the early 1990s (DeSante et al. 1997; DeSante et al. 2007) was

thought to have declined 50% between the 1980s and early 1990s. Breeding owls were greatly reduced in numbers or extirpated from many portions of the San Francisco Bay area (DeSante et al. 1997; DeSante et al. 2007; Townsend and Lenihan 2007). Likewise, breeding owls have declined or disappeared throughout southwestern California (Kidd et al. 2007; Lincer and Bloom 2007; Miller 2007).

## Occurrences within the Study Area

### Historical

At the beginning of the 20<sup>th</sup> century, the burrowing owl was recognized as a common bird of Santa Clara County (Price 1898; Fisher 1904; Van Denburgh 1899). Several years later, Grinnell and Wythe (1927) still found that owls were a “fairly common resident in the drier, unsettled interior parts of the region,” being most abundant in Alameda, Contra Costa and Santa Clara counties. In 1951, Sibley still saw adults and young at a location in what is now downtown San José (Sibley 1952).

Early references to the status of burrowing owls in the San Francisco Bay area (Grinnell and Wythe 1927; Grinnell and Miller 1944) consisted of qualitative comments on owl distribution and numbers rather than numerical population estimates because there had been no systematic population surveys. The pattern of land use practices and their effects on owl habitat since the 1960s provides a source of information about general trends in owl numbers. In the 1960s land use (evident in historical aerial photographs) in the Santa Clara Valley was primarily agricultural with orchards and row crops most common. The process of converting orchards to other uses, including commercial development, and abandoning agricultural uses, beginning in the late 1960s and early 1970s, probably increased burrowing owl nesting opportunities. Orchards cleared for development temporarily transformed unsuitable habitat into owl foraging habitat. Such areas became nesting habitat for owls as soon as they were colonized by ground squirrels (which were ubiquitous) as long as the vegetation was maintained short. Nesting owls often occupied such lands the first spring after orchard removal. With hundreds of burrowing owls nesting in the region, lands cleared of orchards were well within dispersal distance for young from nearby territories.

In the 1970s, burrowing owls occurred along the west side of the San Francisco Bay where there were perhaps two dozen pairs in all of south San Francisco, San Mateo, and Redwood City baylands. Owls became much more common moving south around the south end of the bay where there were dozens of pairs in several colonies immediately upland of the baylands in Palo Alto, Mountain View, Sunnyvale, Santa Clara, Alviso, San José, Milpitas, and Newark. Moving up the east side of the bay owls again became less common with perhaps less than two dozen pairs in the Hayward and San Leandro baylands, and small colonies at the Oakland Airport (Thomsen 1971) and Alameda Naval Air Station.

Owls occupied cemeteries, golf courses, road medians, margins of landfills, and other types of grassland-dominated open space in this region. Owls also occupied airports (Thomsen 1971; Trulio 1994; Barclay 2007), railroad yards, and fallow agricultural fields. Development has greatly reduced, and in most areas entirely eliminated, burrowing owl habitat since the 1970s. Trulio (1998) sampled sites known to be occupied by burrowing owls in the Silicon Valley and reported that during the years where data was collected (1981–1988, 1995, and 1998), 70 (57%) of the 123 sites were developed. South of San José in the Santa Clara Valley, burrowing owl abundance declined and the species occurred in more widely scattered colonies or individual pairs, as in Morgan Hill, until the early 2000s (California Natural Diversity Database 2009).

We have no precise estimates of the burrowing owl population in the San Francisco Bay area in the second half of the 20<sup>th</sup> century because there had been no systematic population surveys until 1991–1993 (DeSante et al. 1997; DeSante et al. 2007). The burrowing owl population in the entire south San Francisco Bay area was probably in the neighborhood of 1000 pairs in the 1970s and by 1980 perhaps only 250 pairs remained (Albion Environmental, Inc. 2000a).

DeSante et al. (1997) estimated there were 873 pairs of owls in central California (i.e., Outer Coast, San Francisco Bay area, Central Valley) in the early 1990s. Estimates of the numbers in the San Francisco Bay area were 153 pairs (DeSante et al. 1997) and 165 (DeSante et al. 2007). Results of the statewide survey suggested that there had been approximately 50% declines in both the numbers of owls and the number of breeding groups in the San Francisco Bay area from the period 1986–1991 (DeSante et al. 1997; DeSante et al. 2007). Generally, burrowing owls were most abundant in colonies in grasslands growing on the alluvial plain surrounding the south end of San Francisco Bay immediately upland of south bay marshes (i.e., baylands), and few owls occurred above 200 feet elevation in this region (DeSante et al. 1997; DeSante et al. 2007).

## Recent

### Santa Clara County

As of July 2009, there were 53 occurrences of burrowing owls in Santa Clara County in the California Natural Diversity Database (California Natural Diversity Database 2009). Many of these occurrence records include sightings of several breeding individuals over multiple years. Forty-nine (95%) of the extant occurrences have been reported in the study area since 1990. Burrowing owls were commonly encountered during environmental assessments for development projects throughout the Santa Clara Valley. However, in many cases survey results were not reported to the California Natural Diversity Database, so this source of information is incomplete and cannot be used to derive population estimates or trends.

Using information from various unpublished sources, the burrowing owl population in Santa Clara County in 1997 was estimated to range from 120 to 141 pairs (Table 1; Albion Environmental, Inc. 2000a). Most of these owls occurred at 12 locations where there was more than one pair. At least 10 of these

locations could be termed colonies averaging five or more pairs. Approximately one-third of the county population (43–47 pairs) occurred within the City of San José (Table 1; Albion Environmental, Inc. 2000a). The Santa Clara Valley Water District performed surveys at 41 sites throughout Santa Clara County in the summer of 1998, but detected no burrowing owls at any of these sites, nor in potential habitats adjacent to the project sites (Santa Clara Valley Water District 1998). A survey of 53 sites in the City of San José in 2000 estimated 39 to 40 pairs of owls (Table 1; Albion Environmental, Inc. 2000b).

The HCP/NCCP area was surveyed for breeding burrowing owls from 26 May to 23 July 2008 (Albion Environmental, Inc. 2008a). This survey was conducted at 96 locations: 84 locations inside the HCP/NCCP area and 12 immediately outside the northern and southern boundaries of the HCP/NCCP area where breeding owls were known to occur, i.e., Alviso environs and northern San Benito County. This survey resulted in an estimate of 19–20 pairs in the HCP/NCCP area, 20 to 21 pairs in the City of San José (includes pairs in Alviso outside the plan area) and 21 to 23 breeding pairs when including pairs observed just outside the north and south HCP/NCCP plan area boundaries (Table 1). However, all except two breeding pairs in the plan area were located on either San José International Airport or north San José/Alviso (Albion Environmental, Inc. 2008a).

Owls were observed at 10 (10%) of the 96 locations surveyed. Survey results were sufficient to conclude that owls were absent at 61 (64%) of the locations surveyed and burrowing owl presence/absence was inconclusive (because of limited access or visibility) at 25 (26%) of the locations surveyed. Twenty-two (23%) of the locations surveyed were completely developed and contained no habitat for burrowing owls (Albion Environmental, Inc. 2008a).

**Table 1.** Pairs of burrowing owls known in the City of San José in 1997, 2000 and 2008

Location	Number of pairs		
	1997*	2000**	2008
San José International Airport	15	21	8
Alviso including Water Pollution Control Plant buffer lands	17	14–15	7 (3 single adults)
Undisclosed location	3–7	1	4–5
Undisclosed location	3	1	1
Single pairs at other locations	5	2	0
Total pairs	43–47	39–40	20–21 pairs (3 single adults)

In 2009, 10 locations where burrowing owls had been observed in 2008 or in recent years were surveyed again (Albion Environmental, Inc. unpublished data). Fifteen pairs comprised of 34 adults were recorded in the HCP/NCCP area and 18 pairs, including three pairs observed outside the plan boundary, in northern San Benito County. This suggests a further decline from the 19 to 20 pairs recorded in the plan area in 2008 (Albion Environmental, Inc. 2008a). However, the survey effort in 2009 was much less thorough than in 2008 and some breeding pairs may have been missed.



The City of San José is the only area for which estimates of the numbers of pairs of owls in 1997, 2000, and 2008 can be used to suggest a regional trend across this time period. Based on an estimate of 43–47 pairs in 1997, 39–40 pairs in 2000 and 20–21 pairs in 2008 the population in the City of San José has declined approximately 50% since 1997 (Table 1; Albion Environmental, Inc. 2000a, 2000b, 2008a).

## Natural History

The burrowing owl's life history and reproductive strategy show that it is relatively short-lived, reaches sexual maturity at one year old, has high fecundity and breeding adaptations to take advantage of annual fluctuations in food supply (Newton 1977), and has low juvenile (i.e., first year) and moderate adult survival rates. These characteristics suggest that burrowing owl populations should be expected to change in response to environmental conditions over short time periods.

## Habitat Requirements

Throughout their range, burrowing owls require habitats with three basic attributes: open, well-drained terrain; short, sparse vegetation generally lacking trees; and underground burrows or burrow facsimiles (Klute et al. 2003; Gervais et al. 2008). During the breeding season, they may also need enough permanent cover and taller vegetation within their foraging range to provide them with sufficient prey, which includes large insects and small mammals (Haug et al. 1993; Wellicome 1997). Burrowing owls occupy grasslands, deserts, sagebrush scrub, agricultural areas (including pastures and untilled margins of cropland), earthen levees and berms, coastal uplands (especially by over-wintering migrants, California Natural Diversity Database 2009), and urban vacant lots, as well as the margins of airports, golf courses, and roads (Gervais et al. 2008).

## Vegetation

Vegetative cover and height are significant factors due to the semi-fossorial nature and small size of the burrowing owl (Zarn 1974; Coulombe 1971; Green and Anthony 1989; Trulio 1994). These owls prefer open habitats that afford visibility of approaching predators (Zarn 1974) or contain elevated perches for the same purpose (Green 1983). However, they will tolerate tall vegetation (especially in the rainy season in the early part of the nesting cycle in California) if it is sparse or patchy with open spaces. Low-growing vegetation may provide hiding sites for young owls (MacCracken et al. 1985) and increase hunting efficiency (Johnsgard 1988). Green (1983) found that owls in Oregon avoided habitat with vegetation that impaired the owls' horizontal visibility and did not provide elevated perches. Owls will perch on raised burrow mounds or other topographic relief such as rocks, tall plants, fence posts, and debris piles to attain better visibility (Haug et al. 1993). Tall or dense vegetative cover that prevents

visibility of approaching predators puts burrowing owls at a severe disadvantage. Green and Anthony (1989) found that owls selected areas for nesting with a greater percentage of bare ground than areas where owls did not nest. In the Columbia Basin, an average of 28% cover in occupied owl habitat was reported (Green and Anthony 1989). In Oklahoma, Butts (1973) reported that owls occupied areas where vegetation was 4 inches or less.

At Moffett Federal Airfield in Santa Clara County, occupied burrowing owl habitat contained 44–57% cover, while the average cover in unoccupied fields was 85% (Trulio 1994). Vegetation height averaged 5.6 inches directly around burrows in occupied habitat versus 10.4 inches in unoccupied fields (Trulio 1994). Owls are often found in human-altered habitats such as grazed areas, areas sprayed with herbicide, and areas where vegetation has been removed without harming burrows. These conditions allow owls to stand near the burrow entrance and effectively watch for approaching predators (Coulombe 1971; Green and Anthony 1989; Trulio 1994). Coulombe (1971) noted that burrowing owls abandoned their burrows when vegetation grew too thick or high.

## Burrows

The presence of burrows, usually excavated by fossorial mammals such as ground squirrels or prairie dogs, is a critical component of suitable habitat for burrowing owls because burrows provide security for nesting and shelter from predators and weather. Studies have found that burrow tunnel cross-sections averaged 4.7 by 7.5 inches (12 by 19 centimeters [cm]) (Martin 1973), and enlarged chambers used for nesting averaged 9.8 inches wide by 4.4 inches high (25 cm wide by 11 cm high) (Butts 1973). Tunnels usually slant 15 degrees downward (Zarn 1974).

Owls use burrows dug by other animals such as ground squirrels (*Spermophilus* spp.), badgers (*Taxidea taxus*), and prairie dogs (*Cynomys* spp.), kangaroo rats (*Dipodomys* spp.) and tortoises (*Gopherus* spp.) (Zarn 1974). Burrowing owls in the western U.S. usually dig only to renovate and maintain their burrows, but they are capable of excavating entire burrows (Thomsen 1971; Barclay 2007). Owls often use unlined earthen banks along agricultural irrigation canals and ditches (Haug et al. 1993) especially in the Imperial Valley (Colombe 1971; DeSante et al. 2004; Rosenberg and Haley 2004). Sandy, well-drained soils may be favored for burrows because of the ease of enlargement and rapid drainage after rainfall (Johnsgard 1988). A family group may use up to 10 different burrow entrances in one year (Winchell 1994; Johnson 1986).

At Moffett Federal Airfield, Trulio (1994) reported an average burrow density of 63 burrows/acre in fields where owls nested. Burrow density was much higher around active owl nests, where the average burrow density was approximately 200 burrows/acre in a 24-foot radius around active nests (Trulio 1994). In fields not occupied by owls for 5 years, the average burrow density was 7 burrows/acre. Coulombe (1971) reported that the number of available burrow sites was apparently the major factor controlling the abundance of burrowing owls in the Imperial Valley of California. Grant (1965) indicated that nesting areas are

always in the vicinity of perch sites such as fences, utility poles, or the raised mounds around rodent burrows. Winchell (1994) observed 136 burrowing owls utilizing 224 separate burrows, 56 of which contained nests, showing that burrowing owls use more than one burrow within their home range. Other studies have noted that it is common for juveniles to use satellite burrows farther away from the nest site as they begin to fly and disperse (Zarn 1974). Rich (1984) found that 39% of burrows used by burrowing owls were reused the following year.

In natural settings, burrowing owls often occupy burrows under protective surfaces such as rock (Rich 1984), lava flows (Gleason and Johnson 1985), and limestone (Coulombe 1971), perhaps as a protection against digging predators (Rich 1984) or collapse by natural processes. In human-modified environments owls often use burrows under the edges of concrete, asphalt, and rubble piles.

Burrowing owls also use artificial burrows installed to increase burrow availability (Collins and Landry 1977; Poulin 2000; Smith and Conway 2005; Barclay 2008), mitigate effects of development projects (Trulio 1995; Smith and Belthoff 2001), conserve individual colonies (Hjertaas 1997; Barclay 2007), facilitate reintroductions (Leupin and Low 2001; Martell et al. 2001; Poulin et al. 2006), enhance conservation (Wellicome et al. 1997; Smith and Conway 2005; Smith et al. 2005), and enable research on aspects of breeding biology not easily studied in natural burrows (Henny and Blus 1981; Haug et al. 1993; Wellicome 1997, 2005; Poulin and Todd 2006; Barclay 2008). Barclay (2007) reported a 43% occupancy rate of artificial burrows by adult owls during the nesting season at San José International Airport over an 11-year period.

**Table 2.** Habitat Associations for Western Burrowing Owl

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Herbaceous dominated	Nesting, shelter, refugia	Primary	Burrows mostly dug by other animals including the California ground squirrel	The presence of nest burrows, dug by fossorial mammals such as ground squirrels, seem to be a critical requirement for burrowing owls. Typically forage in habitats characterized by low-growing vegetation (Haug et al. 1993). Often use unlined earthen banks along agricultural ditches vegetation (Haug et al. 1993)
Agricultural	Nesting, shelter, refugia	Secondary	See above	See above
Ruderal	Nesting, shelter, refugia	Secondary	See above	See above; may use urban levees if suitable burrows are available (Haug et al. 1993)
Urban-Suburban	Nesting, shelter, refugia	Secondary	See above	See above; may use urban levees if suitable burrows are available (Haug et al. 1993)
Rural residential	Nesting, shelter, refugia	Secondary	See above	See above; may use urban levees if suitable burrows are available (Haug et al. 1993)

## Diet

Burrowing owls are opportunistic predators that will consume arthropods, small mammals, birds, amphibians, and reptiles (Haug et al. 1993; Karalus and Eckert 1987; Gervais et al. 2008). Owls typically forage in habitats characterized by low-growing, sparse vegetation (Haug et al. 1993). Insects are often taken during the day, especially during the summer, while small mammals are taken at night. In California, crickets and meadow voles (*Microtus* sp.) were found to be the most common food items (Thomsen 1971). Nocturnal foraging can occur up to several kilometers away from the burrow; and owls concentrate their hunting on uncultivated fields, ungrazed areas, and other habitats with an abundance of small mammals (Haug and Oliphant 1990). In urban areas, burrowing owls are often attracted to streetlights, where insect prey congregates.

## Reproduction

Burrowing owls reach sexual maturity at one year of age. Nesting in California generally runs from February through August, with peak activity from mid-April to mid-July (Zeiner et al. 1990; Thomsen 1971; Gervais et al. 2008). Burrowing owls are primarily monogamous and typically breed once per year; however, Gervais and Rosenberg (1999) reported burrowing owls producing a second brood of young in the Central Valley. Clutch sizes range from one to eleven eggs (Murray 1976) and average eight eggs (Haug et al. 1993). The number of eggs laid is affected by prey abundance: the more food that is provided to the female the more eggs tend to be laid (Wellicome 1997). Incubation lasts 28–30 days. Females supplemented with food can have higher reproductive success than females without supplemented food, which may explain poor reproductive success in areas with low-quality foraging habitat (Wellicome 1997). An average of 78% of potentially reproductive pairs at Moffett Airfield (Trulio 1994, 1997) produced emergent young over seven breeding seasons. Trulio and Chromczak (2007) reported an average of 51% of urban nests produced young compared to 45% of parkland nesting successful over a seven year period in northern Santa Clara County.

The female performs all the incubation and brooding and stays in the burrow nearly continuously while the male does the provisioning. Because incubation begins before the clutch is complete, eggs hatch asynchronously. Asynchronous hatching is an adaptation to annual variation in prey abundance, whereby more young can be raised during years when prey is plentiful (Newton 1977, 1979; Wellicome 2005). The young begin emerging from the nest burrow when about two weeks old, and they remain closely associated with the nest burrow or nearby satellite burrows for several weeks (Thomsen 1971). As the young mature they begin venturing farther from the natal burrow, sometimes abandoning it entirely and moving to a satellite burrow(s). Young burrowing owls fledge at 44 days but usually remain in the natal territory, and as they mature they join the adults in foraging flights at dusk (Rosenberg et al. 1998).

**Table 3.** Key Seasonal Periods for Western Burrowing Owl

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding		✓	✓	✓	✓	✓	✓	✓				
Migration			✓	✓					✓	✓		
Winter Movements	✓										✓	✓
Source: Haug et al. 1993.												

## Territory and Home Range

Thomsen (1971) calculated an average territory size (defended area around the nest burrow) of 1.98 acres (range 0.1–4.0 acres) for six territories studied at the Oakland, CA, Airport. Rosenberg and Haley (2004) reported average nearest neighbor distances from 125–166 meters (410–546 feet.) in the Imperial Valley. Martin (1973) reported an average distance of 545 feet between occupied burrows in New Mexico, yielding an estimated territory of 5.4 acres.

Home range, which is the entire area of an animal's movements for foraging, roosting, nesting and raising young, likely varies depending on local habitats present and local prey resources (Gervais et al. 2008). Rosenberg and Haley (2004) reported estimates of 114 hectares (280 acres) for the area traversed and 45 hectares (111 acres) for the area used by burrowing owls in the Imperial Valley. Rosenberg and Haley (2004) found that >80% of nocturnal foraging of telemetered owls in the Imperial Valley was within 600 meters of the nest, but long-distance movements also occurred. Home ranges for six radio-marked owls in Saskatchewan ranged from 35 to 1,200 acres with an average of 595 acres (Haug and Oliphant 1990). Activity data in this study showed that owls spent most of the daylight hours within 164 feet of the nest burrow and never traveled farther than 820 feet of the nest burrow during the day. Nocturnal activity data showed owls flew long distances to forage at night (maximum of 8859 feet, 1.6 miles) from their nest, but 95% of movements were within 1968 feet (0.4 miles) from their nest (Haug and Oliphant 1990).

## Movement, Migration, and Dispersal

California supports year-round resident burrowing owls and over-wintering migrants (Gervais et al. 2008). Dispersal in burrowing owls that nest in California is variable depending on location and the age of the owls. Many owls remain resident throughout the year in their breeding locales (especially in central and southern California) while some apparently migrate or disperse in the fall (Haug et al. 1993; Coulombe 1971; Barclay et al. 2007). Owls breeding in northern California locales and at higher altitudes (e.g., Modoc Plateau) are believed to move south during the winter (Grinnell and Miller 1944; Zeiner et al. 1990). Thomsen (1971) reported that owls stayed on their breeding grounds in

Oakland during the winter and remained in their burrows in the daytime. Other researchers report that burrowing owls may “wander” during the winter months, occasionally appearing and disappearing from their breeding grounds (McCaskie et al. 1988; Martin 1973). Rosier et al. (2006) reported post-breeding dispersal ranging from 0.2 to 53 km for adult male burrowing owls in the Carrizo Plain (San Luis Obispo County).

Several years of year-round monitoring at Moffett Federal Airfield (Trulio 1994) and Mineta San José International Airport (Barclay 2007) show that the number of owls observed declines during the fall and winter months beginning in October and lasting into March. This information does not prove that owls actually leave during the winter (see banding summary below); they could be simply less visible, as shown by LaFever et al. (2008) and suggested by Thomsen (1971) and Coulombe (1971), because they spend more time in their burrows during the day. Trulio (1994) reported that the number of burrows used at Moffett Federal Airfield did not decline during the winter, suggesting owls are less visible during the winter months. In central California, burrowing owls occur only as winter visitors in some coastal areas that appear to contain suitable breeding habitat (California Natural Diversity Database 2009; Barclay unpublished data). Burrowing owls breeding north of California are believed to migrate south with some birds over-wintering in California (Coulombe 1971; Barclay et al. 2007).

Recoveries of burrowing owls banded in California are another source of information about the nature of owl migration and dispersal. The U.S. Geological Survey Bird Banding Laboratory records (through August 2003) contained 106 encounters of 4708 burrowing owls banded in California (Barclay et al. 2007). Seventy-five (71%) of these encounters occurred in the same 10-minute block of longitude and latitude where the owls were banded, and 27 (25%) occurred in the 10-minute block adjacent to where they were banded. Of the remaining four encounters of owls that were banded and recovered in California, all were less than 95 km from the block where they were banded (Barclay et al. 2007). Recoveries included four records of owls that were banded outside California (two in Idaho, one in Washington, one in British Columbia) and recovered in California. Two owls banded in California were encountered outside the state: an owl banded in June 1975 in coastal southern California (Orange County) was recovered in November 1975 at an unspecified location in Mexico; the other was banded in October 1965 in Orange County (in the same 10-minute block as the owl recovered in Mexico) and encountered two and a half years later (March 1968) in Nevada (Barclay et al. 2007).

There were 1615 burrowing owls banded in the San Francisco Bay area through 2003 (Barclay et al. 2007). Although there have been numerous sightings of color banded owls near the locations where they were banded, there have been no sightings or recoveries of these banded owls outside the Santa Clara Valley reported (through August 2003) to the Bird Banding Laboratory (Barclay et al. 2007). Four burrowing owls banded at San José International Airport have been encountered at NASA/Ames Moffett Federal Airfield approximately 7.5 miles away. These movements represent the longest distance movements of any of the over 700 burrowing owls banded at San José International Airport since 1993 (Barclay et al. 2007; Barclay unpublished data).

## Site Fidelity

Burrowing owls exhibit strong site fidelity and return to nest in the same areas year after year (Martin 1973; Bent 1938; Zarn 1974). Rosenberg and Haley (2004) reported that 85% of adults remained within 400 meters of the previous year's nest in the Imperial Valley. They observed that females tended to move greater distances between breeding seasons than males and distances were greater for owls that failed at nesting. Owls often nest in the same burrows in subsequent years, although Rich (1984) reported that they tend to occupy the same burrows for one to three years before moving to other burrows. Juvenile burrowing owls use satellite burrows during dispersal (Zarn 1974). Rosier et al. (2006) reported variable post-breeding dispersal of adult owls in the Carrizo Plain (San Luis Obispo Co.). Adults that failed at nesting tended to move greater distances, up to 53 km, than adults that were successful (Rosier et al. 2006).

74% of occupied burrows were reoccupied at Moffett Airfield between 1992 and 1994 (Trulio 1994). Burrowing owls at Moffett used many of the same or nearby (within eyesight) burrows year after year. Owls used 42 different burrows during this study. Seven (17%) burrows were used all three years, and 24 (57%) were used only two of the three years. Of the 11 burrows not reused, three were destroyed, two were only used during the early spring, and six were used for nesting only once.

Burrowing owls that have been intentionally relocated have generally shown strong fidelity to the sites from which they were moved. Feeney (1997) summarized the results of 14 relocations involving 104 owls that were relocated from 1–150 miles at different times of the year for various reasons. Owls tended to remain at or return to their original sites when the “relocation” consisted of closing occupied burrows (i.e., eviction). Owls transported to relocation sites tended to disappear from those sites shortly after release. Four birds relocated 48 km (30 miles) during the breeding season returned to their original sites the same day. Bloom et al. (2003), summarizing results of burrowing owl translocations in southern California, suggested well-planned, pre-breeding season translocations from breeding enclosures are probably the best long-term management tool.

Delevoryas (1997) reported on the active relocation of five pairs of owls at the beginning of the breeding season (February) in Santa Clara County. Four pairs of owls relocated 19 miles, kept in aviaries, and released in March nested on the relocation site. Two of the relocated pairs successfully raised young. Three females that experienced failed nesting attempts returned to the capture site. Six owls remained on the relocation site for one year, two were present two years later, and at least one owl was observed on the site four years later. Failure to maintain habitat in appropriate condition for burrowing owls may have contributed to owls dispersing from the relocation site (Delevoryas 1997).

**Table 4.** Movement Distances for Western Burrowing Owl

Type	Distance/Area	Location of Study	Citation
Home range (male)	May forage over 2–3 square km during nesting season	Saskatchewan	Haug and Oliphant 1987
	114 hectares	Imperial Valley, CA	Rosenberg and Haley 2004
Dispersal	Juveniles disperse about 0.6 km from natal burrows after fledging	Idaho	King and Belthoff 2001
	Adults disperse an average of 3.1 km (range 0.2–53 km)	Carrizo Plain, CA	Rosier et al. 2006
Migration	Highly variable, little data; Bay Area birds may be year-round residents		Haug et al. 1993; DeSante et al. 1997; Harman and Barclay 1997

## Ecological Relationships

In California western burrowing owls most commonly live in burrows created by California ground squirrels (*Spermophilus beecheyi*) (Gervais et al. 2008). Accordingly, the suitability and quality of burrowing owl habitat in the study area is closely and positively related to the occurrence and population health of ground squirrels in an area. Burrowing owls and ground squirrels can co-inhabit the same burrow systems, but the frequency with which this occurs has not been measured, and underground interactions have not been studied. Burrowing owls may compete incidentally with other predators such as coyotes, other owls and hawks, skunks, weasels, and badgers for rodents and a variety of insects (Rosenberg et al. 1998).

## Burrowing Owls and Development

Wesemann and Rowe (1987) and Millsap and Bear (2000) studied the relationship between burrowing owl density and reproduction along an urban development gradient in Cape Coral, Florida where development ranged from <2% to >80%. They found that burrowing owl density and productivity of successful nests increased until 45–60% of the landscape was developed, and above that level owl density and reproduction declined. Wesemann and Rowe (1987) attributed the increase in owl density up to the 60% development level to increased prey abundance on developed lots containing irrigated landscape vegetation. Above 60% development owl numbers declined even though prey abundance continued to increase. Wesemann and Rowe (1987) concluded that, above 60% development, factors not related to food availability such as disturbance, burrow destruction, pets, collisions with automobiles, and reduced open space contributed to declining owl numbers.

Analysis of the environment in terms of six basic habitat types (defined by classification of reflectance of a Landsat image, Buchanan 1996) around burrowing owl nesting locations in the Santa Clara Valley revealed there was an



average of 139.5 acres of burrowing owl habitat within 0.5 miles of 62 locations where owls nested in the Santa Clara Valley in 1991 (Albion Environmental, Inc. 2000a). This translates into about 28% burrowing owl habitat (as defined during image classification) in the area within 0.5 miles of known burrowing owl nests. This proportion of burrowing owl habitat would be a useful minimum threshold to consider when evaluating the suitability of candidate burrowing owl preserve lands. This threshold of habitat availability could indicate that parcels much less than 139.5 acres where burrowing owls nest may be useful candidates for preservation, as long as the minimum threshold of habitat availability around those parcels is present.

The relationship between burrowing owls and development in Florida may have operated in the northern Santa Clara Valley and contributed to higher burrowing owl numbers and densities when this portion of the valley was less developed. Recent trends in breeding burrowing owl numbers (Table 1) suggest the threshold of development has been passed. The relationship between burrowing owl numbers and development and open space suggest the best remaining opportunities for burrowing owl habitat management and preservation are in the northern portion of the plan area, where there is more open space in the baylands.

## Survival and Causes of Mortality

### Survival

Estimates of juvenile survival rates (i.e., during their first year of life) range from 0.12 (Lutz and Plumpton 1997) to 0.30 (Thomsen 1971). Adult survival rates have ranged from 0.42 (Johnson 1997) to 0.81 (Thomsen 1971). Rosenberg and Haley (2004) reported annual survival rates of 0.65 for males and 0.62 for females. The maximum known age of a wild burrowing owl is 11 years (Dunning 2001). Recoveries of owls banded in California include an owl that was banded as a nestling and found dead seven years later (1974–1981) after being hit by an aircraft (Barclay et al. 2007). There is little information on lifetime reproductive success (Haug et al. 1993).

### Causes of Mortality

Causes of mortality in burrowing owls include predation (by hawks, owls, badgers, foxes, domestic cats, and others (Bent 1938; Coulombe 1971; Green 1983; Haug et al. 1993), vehicular collisions, disease and parasites (Haug et al. 1993). Juvenile owls experience the greatest mortality (see above) during the post-fledging period (Clayton 1997). Vehicular collisions, which accounted for 25–60% of burrowing owl mortalities in three studies (summarized in Haug et al. 1993), are a significant cause of mortality because burrowing owls habitually perch and hunt on roadways at night (Bent 1938; Haug et al. 1993). Burrow destruction and other anthropogenic factors, especially during the breeding season, (e.g., agricultural and construction activity, disking, shooting, and pest control) also contribute to burrowing owl mortality (Zarn 1974; Thomsen 1971; Haug et al. 1993).

Some researchers have suggested that burrowing owls may be affected by secondary poisoning through ingestion of compounds used to control ground squirrels (Remsen 1978; Zarn 1974). Two studies of the effects of strychnine to control ground squirrels on predatory birds (Schmutz et al. 1989; James et al. 1990) did not document burrowing owl mortality due to strychnine. However, James et al. (1990) concluded that strychnine could have sublethal effects on burrowing owls. The potential for secondary poisoning of burrowing owls probably varies with the local prey base, the extent to which owls feed on the species being targeted for poisoning, and the type of control agents used. James and Fox (1987) reported lower productivity and possible direct mortality of owls exposed to carbofuran pesticide used to control grasshoppers in Saskatchewan.

## Population Status and Trends

**Global:** *Declining* (NatureServe 2006)

**State:** *Priority 2* ( Shuford and Gardali 2008)

**Within Study Area:** *Declining*

## Threats

The most immediate threats to the burrowing owl are the conversion of grassland habitat to urban and agricultural uses other than livestock grazing and the loss of suitable agricultural lands to development (Gervais et al. 2008). Equally important is the loss of fossorial rodents, such as ground squirrels, across much of the owl's historical range (Gervais et al. 2008). Eradication programs have decimated populations of these rodents and have in turn disrupted the ecological relationships on which owls depend; because western burrowing owls typically need other animals to dig their burrows, the loss of fossorial rodents limits the extent of year-round owl habitat throughout their range (Haug et al. 1993).

## Data Characterization

As of July 2009, there were 53 occurrences of burrowing owls in Santa Clara County in the California Natural Diversity Database (2009). Existing information, including surveys for nesting owls in the plan area in 2008 (Albion Environmental, Inc. 2008a) should be sufficient to evaluate the population status of this species in the planning area; however, much of the HCP/NCCP planning area includes private lands that have not been surveyed systematically for this species.

## Existing Conservation Actions in the Study Area

The City of San José prepared a draft burrowing owl habitat conservation strategy and implementation plan in 2000 (Albion Environmental, Inc. 2000a), but the City Council did not adopt it. The City of San José passed a disking ordinance (Chapter 9.54) in 2000 prohibiting disking in most of the city. Mineta San José International Airport has been implementing a burrowing owl management program since the mid-1990s (Barclay 2007).

In 2003, the City of Morgan Hill adopted a citywide burrowing owl habitat mitigation plan. In October 2003, the also city adopted an ordinance making it unlawful for anyone to disk, plow, or otherwise break into or turnover soil on any property within the city if the land meets certain criteria for burrowing owl occupancy.

Most of the research studies emphasize nest site selection, passive relocation, use of artificial burrows, reproductive success, dispersal, and foraging behavior. Common management efforts employed to conserve existing burrowing owl colonies include prevention of all disturbance during the nesting season, installation of permanent artificial burrows (Barclay 2007, 2008), and management of the vegetation around the burrows by mowing or controlled grazing.

Delevoryas (1997) reported on the active relocation of five pairs of owls at the beginning of the breeding season (February) in 1990 in Santa Clara County. Four pairs of owls relocated 19 miles, kept in aviaries, and released in March nested on the relocation site. Two of the relocated pairs successfully raised young. Three females that experienced failed nesting attempts returned to the capture site. Six owls remained on the relocation site for one year, two were present two years later and at least one owl was observed on the site four years later. Failure to maintain habitat in appropriate condition for burrowing owls may have contributed to owls dispersing from and not returning to the relocation site (Delevoryas 1997).

## Burrowing Owl Conservation and Management Activities

Burrowing owl conservation and management have been the subjects of several plans spanning a broad spatial scale from continental to regional to site-specific. These include the tri-national North American Conservation Action Plan for the Western Burrowing Owl (Commission for Environmental Cooperation 2005), the Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States (Klute et al. 2003), Recovery Strategy for the Burrowing Owl (*Athene cunicularia*) in Canada (Environment Canada 2007), Recovery Plan for the burrowing owl in Canada (Hjertaas 1997), and Effects of management practices on grassland birds: burrowing owl (Dechant et al. 1999). The California Department of Fish and Game is preparing a Conservation Strategy for burrowing owls in California (Burkett and Johnson 2007).

Concern about range-wide declines of western burrowing owl populations in many areas was the impetus for three International Burrowing owl Symposia; the first in 1992 (Lincer and Steenhoff 1997), the second in 1998 (Wellicome and Holroyd 2001), and the third in 2006 (no proceedings). A California Burrowing Owl Symposium (Barclay et al. 2007) was convened because of concern about declines in California.

Efforts to manage burrowing owls have employed a variety of techniques to address site-specific goals and conditions. Common management activities have addressed habitat management on preserve lands (Albion Environmental, Inc. 2004; Johnson 1986; Stanton and Teresa 2007), evaluation of impacts from development projects (Albion Environmental, Inc. 1997, 1999; Bendix 2007; Smith and Belthoff 2001; Trulio 2001), prevention of disturbance during the nesting season (Koshear et al. 2007), installation of artificial burrows (Collins and Landry 1977; Poulin 2000; Smith and Conway 2005; Smith et al. 2005; Barclay 2008), and management of burrowing owls on military installations and airfields (Albion Environmental, Inc. 2008b, Barclay 2007; Garcia and Conway 2007; Rosenberg et al. 1998; Trulio 2001).

The reintroduction of burrowing owls into vacant range has been done with limited success in British Columbia (Munroe et al. 1984; Leupin and Lowe 2001), Manitoba (De Smet 1997) and Minnesota (Martell et al. 2001), and on a small experimental scale locally in the Coyote Valley (Delevoryas 1997).

Management practices have also been implemented to address the unwanted occurrence of burrowing owls in some settings. These include passive relocation (Trulio 1995; Bendix 2007) and active relocation (Feeney 1997; Bloom et al. 2003) to address the occurrence of owls in development projects (Smith and Belthoff 2001) and avoid direct impacts (i.e., take). Management has also been designed to address predation of burrowing owls on other special-status species (Garcia and Conway 2007).

**Table 5.** Conservation Actions in the Study Area for Western Burrowing Owl

Action	Timing	Lead Agency	Location
Burrowing owl mitigation program	On-going	San José International Airport	San José
Burrowing owl habitat mitigation program and ordinance	On-going	City of Morgan Hill	Morgan Hill
Burrowing owl mitigation program	Being considered by staff	City of San José	San José

## Modeled Species Distribution in Study Area

### Model Description

#### Model Assumptions

##### Occupied Nesting Habitat

Occupied nesting includes sites occupied within the previous 3 years that are surrounded by at least 140 acres of foraging habitat within 0.5 mile of the nest site. The 140 acres parameter was mapped based on aerial photo analysis of known occupied nest sites.

##### Potential Nesting Habitat

Any grassland, agricultural, or barren land cover types that are located outside of the 0.5 mile radius around occupied nest sites, and inside of one of the burrowing owl conservation zones shown in Figure 2.

##### Overwintering Only Habitat

All annual grassland, serpentine bunchgrass grassland, valley oak woodland, agricultural, and barren land cover types with flat (0–5%) or moderate (5–25%) slopes, outside of one of the burrowing owl conservation zones shown in Figure 2.

### Rationale

#### Occupied Nesting Habitat

In the late 1990s the City of San José (2000) studied all extant burrowing owl nest locations within San José and surrounding environs, and discovered that there was an average of 140 acres of suitable habitat (out of a total of approximately 503 total acres) within 0.5 mile (i.e., the typical foraging distance). The number of breeding pairs at each colony (one or more nesting pairs located in relatively close proximity) varied from one to many. Due to the urbanized and fragmented landscape in San José, it is assumed that the available habitat supports more breeding pairs than found in burrowing owl populations away from urbanized areas.

Based on these studies, the Plan assumes that in order to remain viable, a nesting location needs to be accompanied by at least 140 acres of essential foraging habitat within 0.5 mile. The same habitat could support multiple pairs. This clumping of nesting pairs (colonies) can be observed at any of the breeding colonies in the South San Francisco Bay Area (i.e., San José International Airport, Moffett Federal Airfield, and San José/Santa Clara Water Pollution Control Plant).

Occupied burrowing owl nesting habitat modeled for the Plan is comprised of two components, a specific location containing one or more active nests, and the essential foraging habitat that supports the nest or nests. Because owls tend to re-use sites, if a burrowing owl nest site has been confirmed on a parcel at any point during the previous 3 years, then that parcel is considered a burrowing owl nest location. Based on the known propensity of burrowing owls to forage within 0.5

mile of nest sites during the breeding season (Haug and Oliphant 1990; Rosenberg and Haley 2004), essential burrowing owl foraging habitat is defined as the parcel where the documented burrowing owl nest location is located and all parcels with undeveloped, grassland or barren land, within 0.5 mile of the nest location. If any portion of a parcel with suitable foraging habitat falls within 0.5 mile, the entire parcel is considered essential foraging habitat.

To confirm the current location of nest sites a survey was commissioned in 2008, with a focused follow up in 2009, to determine the number of viable breeding locations and to estimate the number of burrows that currently support a breeding pair in the study area. Burrowing owls were only documented in five locations within the study area (Albion Environmental Inc. 2008). All of those locations were within the urban service area of the City of San José. The highest concentration of nesting burrowing owls occurred in the northern part of the study area, at the San José International Airport, the San José/Santa Clara Water Pollution Control Plant and adjacent lands, and at the VTA Cerrone bus yard. One additional pair was located in southeastern San José (Albion Environmental Inc. 2008).

### **Potential Nesting Habitat**

Open grassland or barren lands on the valley floor that are outside of a 0.5 mile radius of occupied nest sites could potentially be successfully colonized by nesting burrowing owls in the future as long as there are no limiting factors associated with those lands. These are areas where burrowing owls have not been documented nesting in the recent past but where habitat conditions are such that individuals could successfully colonize in the future.

### **Overwintering Only Habitat**

Western burrowing owls typically occur in dry, open, shortgrass, treeless plains often associated with burrowing mammals (Haug et al. 1993). Golf courses, cemeteries, road allowances within cities, levees, and ruderal borders around agricultural fields, airports, and vacant lots in residential areas are also used for breeding, foraging, and overwintering. Within the study area annual grassland, serpentine bunchgrass grassland, valley oak woodland, and barren natural communities represent these habitats. Burrowing owls are also known to use the margins of agricultural areas, or even occasionally using the whole field when it is fallow and ground squirrels are allowed to colonize.

## **Model Results**

Figure 2 shows modeled occupied nesting, potential nesting, and overwintering only habitat for the western burrowing owl within the study area. Burrowing owl may overwinter within areas modeled as occupied or potential nesting, but they are unlikely to nest in overwintering only modeled habitat. Suitable habitat is spread widely throughout the valley floor and along the edge of the foothills that border the valley on both sides. Most known occurrences fall within modeled habitat. Some suitable habitat in developed areas may not show up in the output because it cannot be distinguished at this mapping resolution. These are typically small vacant lots or the margins of other land cover types.

## Literature Cited

- Albion Environmental, Inc. 1997. *Burrowing owl management plan Sharpe Depot*. Unpublished report, 29 pages.
- Albion Environmental, Inc. 1999. Burrowing owl mitigation plan for the proposed AAFES building at Sharpe Depot. Unpublished report, 22 pages.
- Albion Environmental, Inc. 2000a. City of San Jose, burrowing owl habitat conservation strategy and implementation plan. Draft Final Report. April 2000.
- Albion Environmental, Inc. 2000b. *Burrowing owl status in the City of San Jose in 2000*. Unpublished report.
- Albion Environmental, Inc. Unpublished data. Supplemental nesting season surveys conducted by Albion Environmental in 2009.
- Albion Environmental, Inc. 2004. *Yolo County grassland park burrowing owl habitat management plan*. Unpublished report prepared for the City of Davis. 12 pages + appendices.
- Albion Environmental, Inc. 2008a. *Burrowing owl survey in the Santa Clara Valley HCP/NCCP*. Unpublished report.
- Albion Environmental, Inc. 2008b. Camp Parks Reserve Forces Training Area burrowing owl management plan. Unpublished report.
- Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Barclay, J.H. 2007. Burrowing owl management at Mineta San Jose International Airport. Pages 146–154 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Barclay, J.H. 2008. A simple artificial burrow design for burrowing owls. *Journal of Raptor Research* 42(2):53–57.
- Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.

- Bendix, J.A. 2007. Passive relocation of burrowing owls on a 57-hectare site in eastern Alameda County. Pages 141–145 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Bent, A.C. 1938. Life Histories of North American Birds of Prey: Hawks, Falcons, Caracaras, Owls. Dover Publications, Inc., New York. 482 pp.
- Bloom, P.H., J.W. Kidd, J.W. Johnson, S.H. Weldy, J.R. Bradley, E. Henkel, and J. Henkel. 2003. *Notes on the effectiveness of burrowing owl translocations in southern California*. Abstract of presentation at the California Burrowing Owl Symposium, November 2003.
- Buchanan, J. 1996. A spatial analysis of the burrowing owl (*Speotyto cunicularia hypugaea*) population in Santa Clara County, California using a geographic information system. M.S. Thesis. San Jose State University.
- Burkett, E.E. and B.S. Johnson. 2007. Development of a conservation strategy for burrowing owls in California. Pages 165–168 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Butts, K.O. 1973. Life history and habitat requirements of burrowing owls in western Oklahoma. M.S. Thesis, Oklahoma State Univ., Stillwater, OK.
- California Natural Diversity Database. 2009. California Department of Fish and Game. Updated as of July 2009.
- Center for Biological Diversity, Defenders of Wildlife, California State Park Rangers Association, Santa Clara Valley Audubon Society, San Bernardino Valley Audubon Society, Tri-County Conservation League. 2003. *Petition to the California Fish and Game Commission and Supporting Information for Listing the California Population of the Western Burrowing Owl (Athene cunicularia hypugaea) as an Endangered or Threatened Species under the California Endangered Species Act*. October.
- Clark, R.J. 1997. A review of the taxonomy and distribution of the Burrowing Owl (*Speotyto cunicularia*). Pages 14–23 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Clayton, K.M. 1997. Post-fledging ecology of burrowing owls in Alberta and Saskatchewan: Dispersal, survival, habitat use, and diet. M.S. Thesis, Univ. Saskatchewan, Saskatoon. 66 pages.



- Collins, C.T. and R.E. Landry. 1977. Artificial nest burrows for Burrowing Owls. *North American Bird Bander* 2:151–154.
- Coulombe, H.N. 1971. Behavior and population ecology of the burrowing owl, *Speotyto cunicularia*, in the Imperial Valley of California. *Condor* 73:162–176.
- Commission for Environmental Cooperation. 2005. *North American conservation action plan, western burrowing owl*. Commission for Environmental Cooperation. Montreal, Canada.
- Cull, R.L. and F. Hall. 2007. Status of burrowing owls in northeastern California. Pages 42–51 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- De Smet, K.D. 1997. Burrowing owl (*Speotyto cunicularia*) monitoring and management activities in Manitoba, 1987–1996. Pages 123–130 in J.R. Duncan, D.H. Johnson, and T.H. Nicholls [editors]. *Proceedings of the second international symposium of the biology and conservation of owls of the northern hemisphere*. USDA Forest Service General Technical Report. NC-190. North Central Forest Experiment Station, St. Paul, MN.
- Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, P.A. Rabie, and B.R. Euliss. 1999 (revised 2002). *Effects of management practices on grassland birds: burrowing owl*. Northern Prairie Wildlife Research Center, Jamestown, ND. 33 pages.
- Delevoryas, P. 1997. Relocation of burrowing owls during courtship period. Raptor Research Report No. 9. Pages 138–144 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- DeSante, D.F., E.D. Ruhlen, S.L. Adamany, K.M. Burton and S. Amin. 1997. A census of burrowing owls in central California in 1991. Pages 38–48 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- DeSante, D.F., E.D. Ruhlen, and D.K. Rosenberg. 2004. Density and abundance of burrowing owls in the agricultural matrix in the Imperial Valley. *Studies in Avian Biology* 27:116–119.

- DeSante, D.F., E.D. Ruhlen, and R. Scalf. 2007. The distribution and relative abundance of burrowing owls in California during 1991–1993: Evidence for a declining population and thoughts on its conservation. Pages 1–41 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Dunning, J.B. Jr. 2001. Significant Encounters: 1998–1999. *North American Bird Bander* 26(4):170–178.
- Environment Canada. 2007. Recovery strategy for the burrowing owl (*Athene cunicularia*) in Canada [Proposed]. *Species at Risk Act Recovery Strategy Series*. Environment Canada, Ottawa. v + 25 pp.
- Feeney, L.R. 1997. Burrowing owl site tenacity associated with relocation efforts. Pages 132–137 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Fisher, W.K. 1904. List of birds of Santa Clara Valley and Santa Cruz Mountains, exclusive of water birds. *Handbook of Birds of the Western United States*, pp. 1i–1vi (F.M. Bailey, ed.) Houghton, Mifflin and Company.
- Garcia, V. and C.J. Conway. 2007. *A plan to conserve and manage burrowing owls on Naval Base Coronado, San Diego, CA*. University of Arizona, Tucson, AZ. Naval Base Coronado EPR Number 00246NR026.
- Gervais, J.A. and D.K. Rosenberg. 1999. Western Burrowing Owls in California Produce Second Broods of Chicks. *Wilson Bulletin* 111:569–571.
- Gervais, J.A., D.K. Rosenberg, and L.A. Comrack. 2008. Burrowing owl (*Athene cunicularia*). Pages 218–226 in Shuford, W.D., and Gardali, T. editors. 2008. *California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California*. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California and California Department of Fish and Game, Sacramento.
- Gleason, R. and D.R. Johnson. 1985. Factors influencing nesting success of burrowing owls in southeastern Idaho. *Great Basin Naturalist* 45:81–84.
- Grant, R.A. 1965. The burrowing owl in Minnesota. *Loon* 37:2–17.
- Green, G.A. 1983. *Ecology of breeding burrowing owls in the Columbia Basin, Oregon*. M.S. Thesis, Oregon State Univ., Corvallis, OR.
- Green, A.G. and R.G. Anthony. 1989. Nesting success and habitat relationships of burrowing owls in the Columbia basin, Oregon. *Condor* 91:347–354.

- Grinnell, J., and A.H. Miller. 1944. The Distribution of the Birds of California. *Pacific Coast Avifauna* No. 27. Cooper Ornithological Club. Berkeley.
- Grinnell, J. and M.W. Wythe. 1927. Directory to the bird-life of the San Francisco bay region. *Pacific Coast Avifauna* No. 18. Cooper Ornithological Club. Berkeley. 160 pp.
- Harman, L.M. and J.H. Barclay. 2007. A summary of California burrowing owl banding records. Pages 123–131 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Haug, E.A. and L.W. Oliphant. 1987. Breeding biology of burrowing owls in Saskatchewan. Pages 269–271 in G.L. Holroyd, W.B. McGillivray, P.H.R. Stepney, D.M. Ealy, G.C. Trottier, and K.K.E. Eberhart, (eds.), *Endangered species in the prairie provinces*. (Occasional Paper No. 9.) Provincial Museum of Alberta.
- Haug, E.A. and L.W. Oliphant. 1990. Movements, activity patterns, and habitat use of burrowing owls in Saskatchewan. *Journal of Wildlife Management* 54:27–35.
- Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. The burrowing owl (*Speotyto cunicularia*). In A. Poole and F. Gill (eds.), *The Birds of North America*, No. 61. Philadelphia, PA: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Henny, C.J. and L.J. Blus. 1981. Artificial burrows provide new insight into burrowing owl nesting biology. *Raptor Research* 15:82–85.
- Hjertaas, D.G. 1997. Recovery plan for the burrowing owl in Canada. Pages 107–112 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- James, P.C. and T.J. Ethier. 1989. Trends in the winter distribution and abundance of burrowing owls in North America. *American Birds* 43:1224–1225.
- James, P. C. and G. A. Fox. 1987. Effects of some insecticides on productivity of burrowing owls. *Blue Jay* 45(2): 65–71.
- James, P. C., G. A. Fox, and T. J. Ethier. 1990. Is the operational use of strychnine to control ground squirrels detrimental to Burrowing Owls? *Journal Raptor Research* 24(4):120–123.
- Johnsgard, P.A. 1988. *North American Owls: Biology and Natural History*. Smithsonian Institution Press. Washington D.C. 245 pp.

- Johnson, B.S. 1986. Management plan for the burrowing owl reserve, appendix D, CONROS 1986 report on the first draft UC Davis long range facilities plan. Submitted 17 December 1986. Unpublished report, UC Davis, Davis, CA.
- Johnson, B.S. 1997. Demography and population dynamics of the burrowing owl. Pages 28–33 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Karalus, K.E. and A.W. Eckert. 1987. *The Owls of North America*. New York, NY: Weathervane Books.
- Kidd, J.W., P.H. Bloom, C.W. Barrows, and C.T. Collins. 2007. Status of burrowing owls in southwestern California. Pages 76–89 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- King, R.A. and J.R. Belthoff. 2001. Post-fledging dispersal of burrowing owls in southwestern Idaho: characterization of movements and use of satellite burrows. *Condor* 103:118–126.
- Klute, D.S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C: 108 pp.
- Koshear, J., C. Shafer, E.F. van Mantgem, and R.V. Olsen. 2007. Burrowing owl management at Colonel Allensworth State Historic Park. Pages 155–164 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- LaFever, D.H., K.E. LaFever, D.H. Catlin, and D.K. Rosenberg. 2008. Diurnal time budget of burrowing owls in a resident population during the non-breeding season. *The Southwestern Naturalist* 53(1):29–33.
- Leupin, E.E. and D.J. Low. 2001. Burrowing owl reintroduction efforts in the Thompson-Nicola Region of British Columbia. *Journal of Raptor Research* 35:392–398.

- Lincer, J.L. and P.H. Bloom. 2007. The status of the burrowing owl in San Diego County, California. Pages 90–102 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Lincer, J.L. and K. Steenhof. (Eds.). 1997. The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium. Raptor Research Report Number 9.
- Lutz, R. S. and D.L. Plumpton. 1997. Metapopulation dynamics of a burrowing owl (*Speotyto cunicularia*) population in Colorado. Pages 255–259 in J.R. Duncan, D.H. Johnson, and T.H. Nicolls (Eds.). *Biology and conservation of owls of the northern hemisphere: Second International Symposium, Winnipeg, Manitoba, Canada*.
- MacCracken, J.G., D.W. Uresk, and R.M. Hansen. 1985. Vegetation and soils of burrowing owl nests in Conata Basin, South Dakota. *Condor* 87:152–154.
- Martell, M.S., J. Schladweiler, and F. Cuthbert. 2001. Status and attempted reintroduction of Burrowing Owls in Minnesota. *Journal of Raptor Research* 35:331–336.
- Martin, D.J. 1973. Selected aspects of burrowing owl ecology and behavior. *Condor* 75: 446–456.
- McCaskie, G., P. De Benedictis, R. Erickson and J. Morian. 1988. *Birds of Northern California*. Golden Gate Audubon Society. Berkeley.
- Miller, J. 2007. Petition to list the Western Burrowing Owl in California. Pages 169–177 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Millsap, B.A. and C. Bear. 2000. Density and reproduction of burrowing owls along an urban development gradient. *Journal of Wildlife Management* 64(1):33–41.
- Munroe, W.T., R.C. Lincoln, and R.W. Ritcey. 1984. Reestablishing burrowing owls – experiences in British Columbia. *Proceedings of the Western Association of Fish and Wildlife Agencies* 64:165–170.
- Murray, G.A. 1976. Geographic variation in the clutch size of seven owl species. *Auk* 93:602–613.
- National Geographic Society. 2002. *Field Guide to the Birds of North America*. (Fourth Edition.) Washington, D.C: National Geographic Society.

- Newton, I. 1977. Breeding strategies in birds of prey. *The Living Bird* 16:51–82.
- Newton, I. 1979. *Population ecology of raptors*. Buteo Books. Vermillion, SD.
- NatureServe. 2006. *NatureServe Explorer: An online encyclopedia of life* [web application]. (Version 4.6.) NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: February 13, 2006.
- Peterson, R.T. 1990. *A Field Guide to Western Birds*. Boston, MA: Houghton-Mifflin Co.
- Poulin, R.G. 2000. *Burrowing owl nest box: construction and installation procedures*. Saskatchewan Environment and Resource Management, Fish and Wildlife Branch, Regina, Saskatchewan, Canada.
- Poulin, R.G. and L.D. Todd. 2006. Sex and nest stage differences in the circadian foraging behaviors of nesting burrowing owls. *Condor* 108:856–864.
- Poulin, R.G., T.I. Wellicome, and R.M. Brigham. 2006. Assessing the feasibility of release techniques for captive-bred burrowing owls. *Journal of Raptor Research* 40:142–150.
- Price, W.W. 1898. The birds of the campus. *The Sequoia* 7(26): 310–311.
- Remsen, J.V. 1978. *Bird species of special concern in California, an annotated list of declining or vulnerable bird species*. California Dept. of Fish and Game, Nongame Wildlife Investigation Project PR W-54-R-9, Report No. 78-1 (June 1978). 52 pp.
- Rich, T. 1984. Monitoring burrowing owl populations: implications of burrow re-use. *Wildlife Society Bulletin* 12:178–189.
- Rosenberg, D.K., J. Gervais, H. Ober, and D. DeSante. 1998. An adaptive management plan for the burrowing owl population at Naval Air Station Lemoore, Lemoore, California.
- Rosenberg, D.K. and K.L. Haley. 2004. The ecology of burrowing owls in the agroecosystem of the Imperial Valley, California. *Studies in Avian Biology* No. 27:120–135.
- Rosier, J.R., N.A. Ronan, and D.K. Rosenberg. 2006. Post-breeding dispersal of burrowing owls in an extensive California grassland. *American Midland Naturalist* 155:162–167.
- Santa Clara Valley Water District. 1998. 1998 Stream Maintenance Project: burrowing owl survey report. Unpublished.
- Schmutz, J.K., K.A. Rose and R.G. Johnson. 1989. Hazards to raptors from strychnine poisoned ground squirrels. *Journal of Raptor Research* 23(4):147–151.

- Shuford, W.D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.
- Sibley, C.G. 1952. The Birds of South San Francisco Bay Region.
- Sibley, D.A. 2000. National Audubon Society: The Sibley Guide to Birds. New York, NY: Knopf.
- Smith, B.W. and J.R. Belthoff. 2001. Burrowing owls and development: short-distance nest burrow relocation to minimize construction impacts. *Journal of Raptor Research* 35:385–391.
- Smith, M.D. and C.J. Conway. 2005. Use of artificial burrows on golf courses for burrowing owl conservation. *USGA Turfgrass Environ. Res. Online* 4(9):1–6.
- Smith, M.D., C.J. Conway, and L.A. Ellis. 2005. Burrowing owl nesting productivity: a comparison between artificial and natural burrows on and off golf courses. *Wildlife Society Bulletin* 33:454–462.
- Stanton, E.J. and S. Teresa. 2007. Management of burrowing owl habitat on mitigation lands. Pages 132–136 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland Municipal Airport. *Condor* 73:177–192.
- Townsend, S.E. and C. Lenihan. 2007. Burrowing owl status in the greater San Francisco Bay area. Pages 60–69 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Trulio, L.A. 1994. The ecology of a population of burrowing owls at a naval air station in northern California. Dept. of the Navy. San Bruno, CA. Unpublished report.
- Trulio, L.A. 1995. Passive relocation: a method to preserve burrowing owls on disturbed sites. *Journal of Field Ornithology* 166:99–106.
- Trulio, L. 1997. Burrowing owl demography and habitat use at two urban sites in Santa Clara County, California. *Journal of Raptor Research* 9:84–89.

- Trulio, L. 1998. The burrowing owl as an indicator of CEQA effectiveness and environmental quality in the Silicon Valley. Environmental Monitor. Association of Environmental Professionals.
- Trulio, L. 2001. Burrowing owl habitat management plan. Evaluation of impacts to burrowing owls and identification of avoidance and mitigation measures for the NASA Ames Development Project. PAI Corporation. Unpublished report. 29 pages.
- Trulio, L.A. and D.A. Chromczak. 2007. Burrowing owl nesting success at urban and parkland sites in northern California. Pages 115–122 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- U.S. Fish and Wildlife Service. 2002. *Birds of Conservation Concern*. U.S. Department of the Interior; Fish and Wildlife Service, Administrative Report, Arlington, Virginia.
- Van Denburgh, J. 1899. Notes on some birds of Santa Clara County, California. *Proc. Amer. Phil. Soc.* 38:157–180.
- Wellicome, T.I. 1997. Reproductive performance of burrowing owls (*Speotyto cunicularia*): effects of supplemental food. Pages 68–73 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Wellicome, T.I. 2005. Hatching asynchrony in burrowing owls is influenced by clutch size and hatching success but not by food. *Oecologia* 142:326–334.
- Wellicome, T.I., G.L. Holroyd, K. Scalise, and E.R. Wiltse. 1997. The effects of predator exclusion and food supplementation on Burrowing Owl population change in Saskatchewan. Pages 487–497 in J.R. Duncan, D.H. Johnson, and T.H. Nicholls [editors]. *Proceedings of the second international symposium of the biology and conservation of owls of the northern hemisphere*. USDA Forest Service General Technical Report. NC-190. North Central Forest Experiment Station, St. Paul, MN.
- Wellicome, T.I. and G.L. Holroyd. 2001. The Second International Burrowing Owl Symposium: Background And Context. *J. Raptor Res.* 35:269-273.
- Wesemann, T. and M. Rowe. 1987. Factors influencing the distribution and abundance of burrowing owls in Cape Coral, Florida. Pages 129–137 in L.W. Adams and D.L. Leedy, editors. *Integrating man and nature in the metropolitan environment*. Proceedings of the national symposium on urban wildlife, National Institute for Urban Wildlife, Columbia, Maryland, USA.



Winchell, C.S. 1994. Natural history and protection of burrowing owls. Pages 83–86 in *Proc. 16<sup>th</sup> Vertebr. Pest Conf. Univ of Calif.*

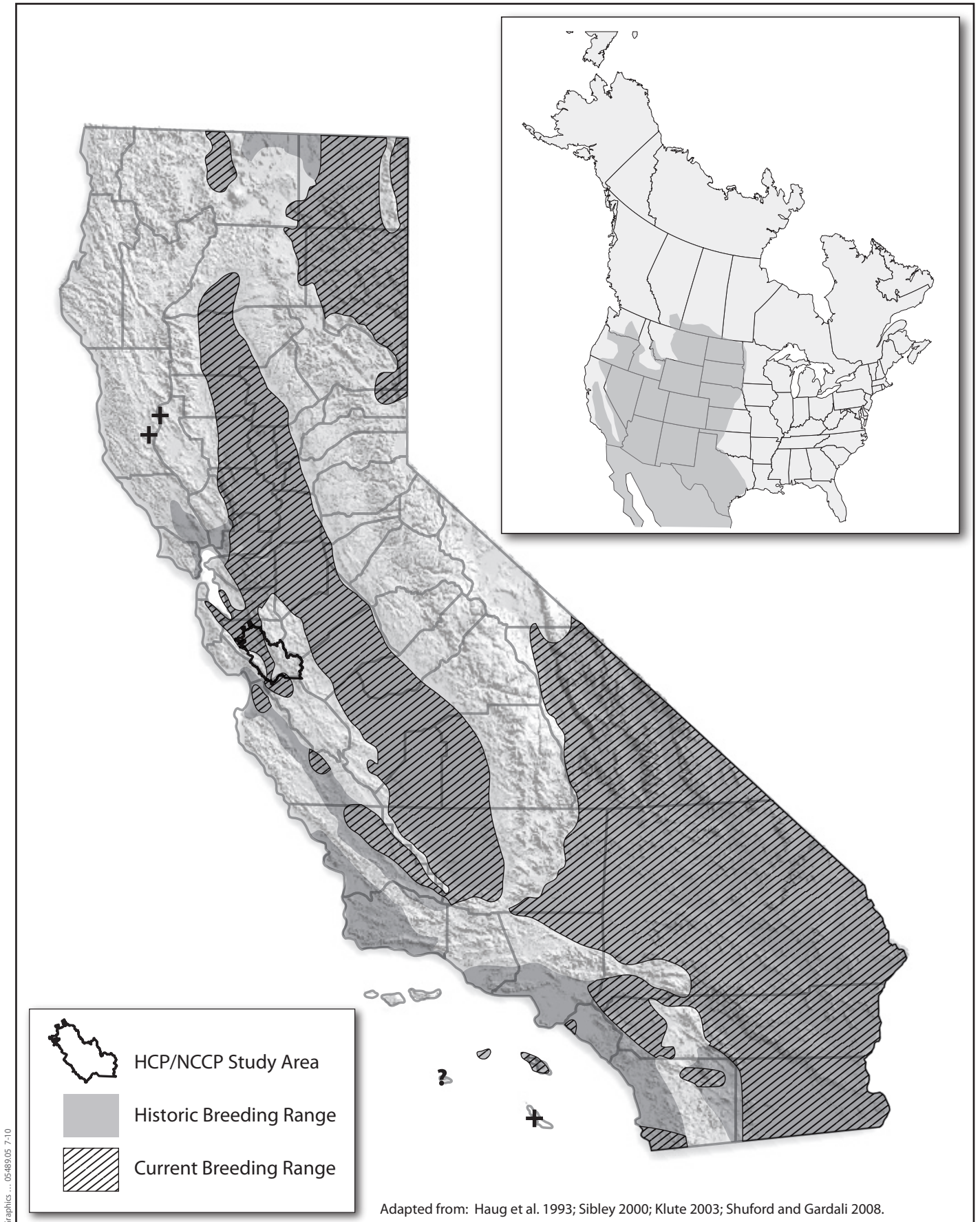
Zarn, M. 1974. Burrowing owl (*Speotyto cunicularia hypugaea*). *Habitat management series for unique or endangered species*, Report. No.11, T-N-250, Bureau of Land Management, Denver. 25 pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1990. *California's Wildlife*. Vol. II. Birds. Calif. Dept. of Fish and Game, Sacramento. 732pp.

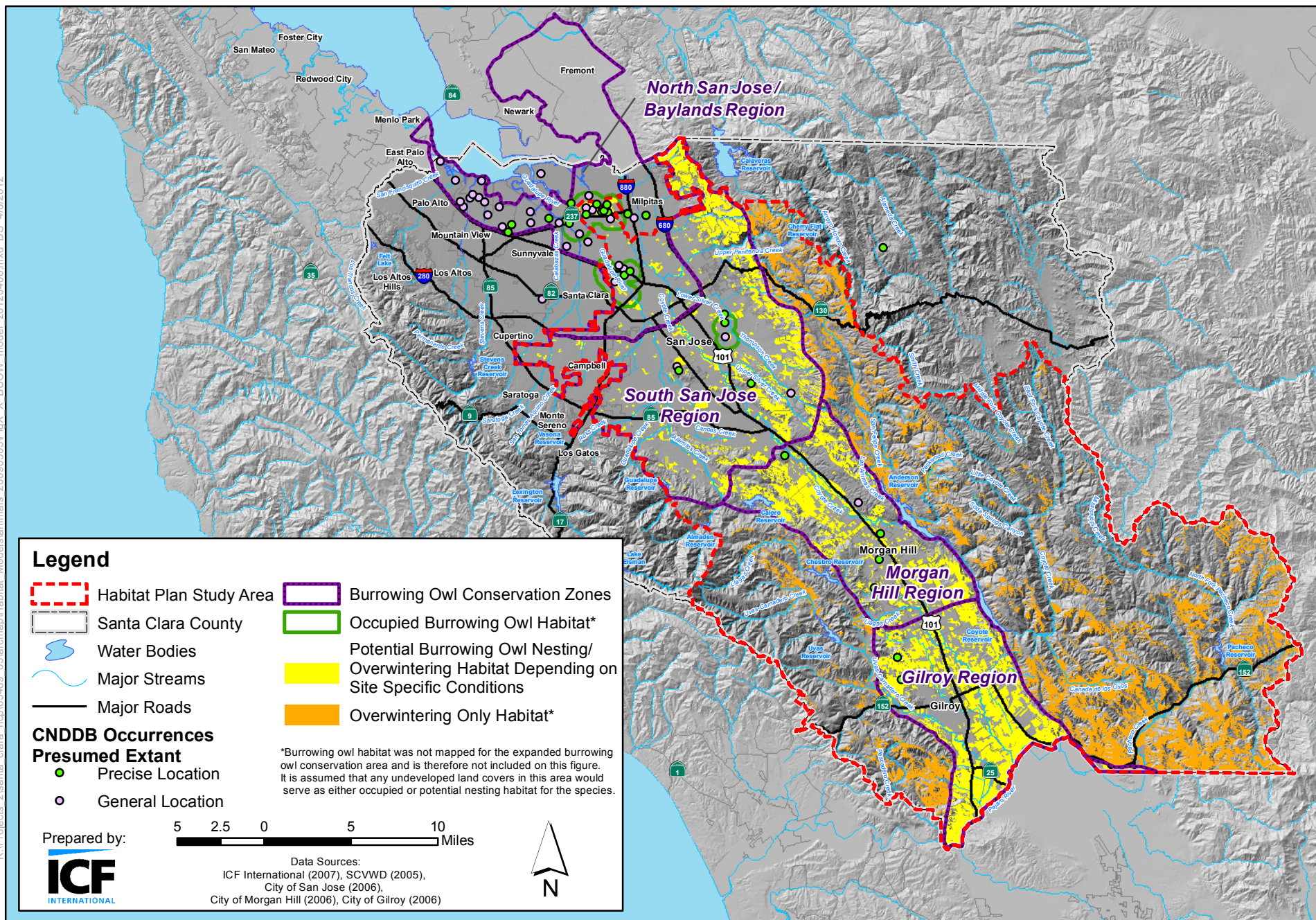
## Personal Communications

Barclay, J. Principal and Senior Wildlife Biologist. Albion Environmental, Inc. Email, phone, and meeting correspondence with Troy Rahmig, Jones & Stokes during the course of Plan development.

Troetschler, R. Volunteer coordinator for the Institute for Bird Populations' Santa Clara County burrowing owl breeding survey, 2006–2007. Email correspondence with Troy Rahmig, Jones & Stokes during spring and summer 2007.







**Figure 2**  
**Burrowing Owl Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Least Bell's Vireo (*Vireo bellii pusillus*)

### Legal Status

**State:** Endangered

**Federal:** Endangered, Migratory Bird Treaty Act

**Critical Habitat:** Designated (1994)

**Recovery Planning:** U.S. Fish and Wildlife Service 1998

**Notes:** No anticipated change in status during permit period.

### Taxonomy

There are four recognized subspecies of Bell's vireo (*Vireo bellii*) including *V. b. belli*, *V. b. medius*, *V. b. arizonae*, and *V. b. pusillus*, the least Bell's vireo (American Ornithologists' Union 1957). While all subspecies are similar in appearance, least Bell's vireos are mostly gray above and pale below, while easternmost birds are greenish above and yellowish below. Southwestern subspecies are intermediate in plumage characteristics. The least Bell's vireo in California is slightly larger than Bell's vireos in Arizona or Texas (Brown 1993). Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (e.g., Sibley 2000; National Geographic 2002; Peterson 1990).

### Distribution

#### General

The Bell's vireo is a migratory species that breeds in North America and overwinters primarily along the Pacific Coast in southern Mexico. Breeding range for Bell's vireo is from north central to southwestern United States and into central Mexico. Breeding has been documented from southwestern California and northwestern Baja California, Mexico, to central South Dakota, east to Illinois and northwestern Indiana, south to the gulf coast and into southern Sonora, Mexico. Breeding in California usually takes place in southwestern California and northwestern Baja California, Mexico. However, recently (1997 and 2001) breeding individuals been reported as far north as southern Santa Clara County along Llagas Creek (Santa Clara Valley Water District 2002, California Natural Diversity Database 2006) (Figure 1). Additional sightings have occurred in southeastern Monterey County (Roberson 2004) and western Merced County. A successful breeding pair has also been documented in 2005 and 2006 in neighboring Stanislaus County, returning to this county for the first time in 40 years (U.S. Fish and Wildlife Service 2005). These sightings corroborate the notion that this species may be expanding back into its historical range.

## Occurrences within the Study Area

### Historical

Historically the breeding range of this species was widespread throughout California, including the Sacramento and San Joaquin Valleys (Grinnell and Miller 1944; U.S. Department of the Interior 1986). Santa Clara County's first record was of a nest with eggs collected by W.E. Unglish on 19 Apr 1932 in a dense willow thicket along the Pajaro River near Sargent (Unglish 1937).

### Recent

One to two individuals were observed during a May 1997 survey along Llagas Creek between Highway 152 and the Pajaro River confluence, east of Gilroy, and a nest was found (Santa Clara Valley Water District 2002; California Natural Diversity Database 2006; Bousman 2007). Subsequent visits were not made to determine whether the nest was successful. In this same area, three adults were observed during surveys in May 2001, but no nests were found. The site has been revisited in subsequent years, and no individuals have been detected (Santa Clara Valley Water District 2002, 2003, 2004). However, the SCVWD has been unable to survey the reaches with the most suitable habitat because they are under private ownership (Padley pers. comm.). Dense riparian corridors (sufficient overstory with a thick shrub understory) have been identified in other waterways in southern Santa Clara County, but no least Bell's vireos have been detected by the SCVWD (Santa Clara Valley Water District 2002, 2003, 2004). In June 2006 a singing Bell's vireo was seen along Coyote Creek near the Coyote Creek Golf Club (South Bay Birders Unlimited 2006). The bird was seen singing but no additional breeding behavior was observed (Mammoser pers. comm.). The extent of this species' range in the study area is not well understood (Figure 2).

## Natural History

### Habitat Requirements

Least Bell's vireo is known to nest in riparian woodlands dominated by willow (Peterson et al. 2004) and Fremont's cottonwood (Kus 2002b). Suitable willow woodlands are typically dense with well-defined vegetative strata or layers. The most critical structural component of nesting habitat in California is a dense shrub layer 2–10 feet (0.6–3.0 meters) above ground (Goldwasser 1981; Franzreb 1989, Brown 1993). Individuals may forage in adjacent scrub or chaparral habitat (U.S. Fish and Wildlife Service 1986). During the winter, the least Bell's vireo utilizes scrub vegetation adjacent to watercourses or riparian gallery forests along the west coast of northern and central Mexico (Hutto 1980).



**Table 1.** Habitat Associations for Least Bell's Vireo

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Riparian woodland	Breeding, foraging	Primary	Typically riparian woodland dominated by willow shrubs and other thick understory vegetation	Goldwasser 1981; U.S. Fish and Wildlife Service 1986
Riparian scrub	Breeding, foraging	Primary	Typically riparian scrub dominated by willow and other thick vegetation	Goldwasser 1981; U.S. Fish and Wildlife Service 1986

## Reproduction

Breeding least Bell's vireos begin arriving on their breeding grounds in late March and begin nesting in early April (Kus 2002a). Individuals may remain on the breeding grounds into early October, but nesting is typically finished by the end of July (Kus 1999). Most pairs are monogamous during the breeding season (Brown 1993). Several factors may have an effect on breeding success including development adjacent to riparian habitat, brown-headed cowbird (*Molothrus ater*) parasitism, and water management.

**Table 2.** Key Seasonal Periods for Least Bell's vireo

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding				✓	✓	✓	✓					
Migration		✓	✓	✓				✓	✓	✓		
Wintering	✓	✓								✓	✓	✓

Sources: Brown 1993; Kus 1999, 2002a.

## Movement

Little is known about the migratory routes of this species. Individuals leave the northernmost breeding grounds by August or September (Barlow 1962). Most have left the U.S. by early October, although some may remain in the Lower Colorado River Valley until late November (Brown 1993). During spring migration, adults return to their breeding grounds in early to mid-March and reach the northern limits of the breeding range in May (Brown 1993; Kus 1999). Home range and movement during the breeding season is limited to areas within dense riparian corridors. Territories are often linear in nature, following the stream course. Size of home ranges is dependent on the quality of breeding habitat available and the number of breeding individuals that the area will support.

**Table 3.** Movement Distances for Least Bell's Vireo

Type	Distance/Area	Location of Study	Citation
Home Range	1.2 acres (0.5 ha)	Kansas	Barlow 1962
	0.5–4 acres (0.2–1.6 ha)	California	Gray and Greaves 1984
	0.7 ha	California	Collins et al. 1989
Dispersal	33 feet (10m) on day 1 to 330 feet (100m) on day 5	Indiana	Hensley 1950
	100–200 feet (30–60m) on day 14		Nolan 1960
Migration	From breeding grounds to Pacific Coast of southern Mexico	North America	Brown 1993

## Ecological Relationships

For successful breeding, this species is dependent on dense riparian corridors, typically along watercourses. Scrub habitats adjacent to these watercourses are equally important to the success of the species because they provide foraging opportunities as well as protection for nesting habitat. Brown-headed cowbirds have decimated Bell's vireo populations throughout its breeding range and this subspecies is no different. Dense riparian breeding habitat that is surrounded by agricultural lands or developed areas will facilitate brown-headed cowbird abundance and lower the breeding success of riparian nesting species like the least Bell's vireo.

## Population Status and Trends

**Global:** *Declining* (Kus 2002a; Peterson et al. 2004; NatureServe 2005)

**State:** *Declining in general but recent evidence of range extensions in San Joaquin Valley*

**Within Study Area:** *Unknown, may be increasing*

Due to extensive alteration of riparian corridors and adjacent habitats throughout its range, this subspecies has increasingly limited breeding habitat. Although populations have shown signs of increased range in California, numbers throughout North America are in decline. At its low point in the early 1980s, the California breeding population of the Least Bell's Vireo was estimated at only 300 pairs. Since the species was listed as endangered under the California endangered Species Act in 1980, and under the federal Endangered Species Act in 1986, riparian habitat restoration and cowbird trapping have resulted in considerable increases in Bell's Vireo population in southern California, which now exceed 1,300 pairs (U.S. Fish and Wildlife Service 1998). The species may be expanding its range northward in California to now include Santa Clara County. Consistent breeding locations will need to be documented in Santa Clara County to confirm a range expansion into the study area.

## Threats

Loss of breeding habitat due to watercourse alteration (e.g., channelization, urbanization and firewood cutting) is threatening the viability of this subspecies. In addition, nest parasitism by the brown-headed cowbird has greatly reduced nest success throughout most of its breeding range. An increase in cowbird abundance is propagated by particular land use practices (e.g., residential development, agriculture, grazing) on lands adjacent to breeding habitats (Kus 1999; NatureServe 2005).

## Data Characterization

Little is known about the occurrence of this subspecies within the inventory area, aside from the recent observations along Llagas Creek. Due to ongoing monitoring efforts along waterways in southern Santa Clara County, potential habitat for this species has been identified, and surveys for breeding pairs are underway. Although this species is rare in Santa Clara County, it is possible that it could expand its range northward during the permit period.

## Existing Conservation Actions in the Study Area

The Santa Clara Valley Water District (SCVWD) has conducted surveys for least Bell's vireo on Llagas Creek since 1997. Starting in 2005 the SCVWD began surveys for least Bell's vireo on Llagas Creek, Pajaro River, and Uvas Creek under its Stream Maintenance Program. Restoration efforts by the SCVWD and other groups like the Fisheries and Aquatic Habitat Collaborative Effort may benefit this subspecies.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

##### Primary Habitat—Breeding and Foraging

Breeding and foraging is limited to all riparian land cover types, including central California sycamore alluvial woodland, in the Pacheco Creek/Uvas Creek/Llagas Creek and Pajaro River watersheds in southern Santa Clara County. Though dense riparian corridors may exist in other parts of the study area, the suitable habitat model is limited to areas where the species has been documented in the recent past.



## Rationale

Although this species nested along heavily vegetated watercourses and associated scrub habitats throughout California, there are no known historical occurrences in Santa Clara County (Grinnell and Miller 1944). However, during a June 1997 survey along Llagas Creek east of Gilroy, a nest was found (Santa Clara Valley Water District 2002; California Natural Diversity Database 2006). During follow-up surveys in 2001, individuals were detected, but nesting was not confirmed. A similar trend has been reported from counties just south and east of Santa Clara County, so it is likely that this species will extend its range over time. However, with the limited survey information available on suitable habitat in southern Santa Clara County and only these two recent occurrences, we are limiting the suitable habitat to the southern portion of the study area.

## Model Results

Figure 2 shows the modeled potential habitat for the least Bell's vireo within the study area. The primary habitat for this species is characterized by well-developed riparian habitat and the modeled habitat corresponds to those land cover types. Due to the limited number of occurrences by the species in the study area determining the accuracy of the model is difficult. However, the known breeding occurrence in the study area does fall within the modeled habitat.

## Literature Cited

### Printed References

- American Ornithologists' Union. 1957. *Check-List of North American Birds*. (5<sup>th</sup> ed.) Washington, D.C.: American Ornithologists' Union.
- Barlow, J.C. 1962. Natural History of the Bell's Vireo, *Vireo bellii*. Audubon. University of Kansas Publication 12:241–296.
- Bousman, W.G. 2007. Breeding Bird Atlas of Santa Clara County, California. Santa Clara Valley Audubon Society. Cupertino, CA. 547 pp.
- Brown, B.T. 1993. Bell's Vireo. In *The Birds of North America*, No. 35 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- California Natural Diversity Data Base. 2006. Occurrence report for *Rana aurora draytonii*. RareFind, Version 3.0.5 (September 30, 2005 update). Sacramento, CA: California Department of Fish and Game.
- Collins, C.T., L.R. Hays, M. Wheeler, and D. Willick. 1989. *The Status and Management of the Least Bell's Vireo within the Prado Basin, California, during 1989*. (Final Report.) Prepared for the Orange County Water District, Fountain Valley, CA.

- Franzreb, K.E. 1989. *Ecology and Conservation of the Endangered Least Bell's Vireo*. (Biological Report 89.) Washington, D.C: U.S. Fish and Wildlife Service.
- Goldwasser, S. 1981. *Habitat Requirements of the Least Bell's Vireo*. (Final Report.) Sacramento, CA: California Department of Fish and Game.
- Gray, M.V. and J.M. Greaves. 1984. Riparian Forest as Habitat for the Least Bell's Vireo. Pages 605–611 in R. Warner and K. Hendrix (eds.), *California Riparian Systems: Ecology, Conservation, and Productive Management*. Davis, CA: University of California Press.
- Grinnell, J. and A.H. Miller. 1944. The Distribution of the Birds of California. *Pacific Coast Avifauna* 27.
- Hensley, M. 1950. Notes on the Breeding Behavior of the Bell's Vireo. *Auk* 67:243–244.
- Hutto, R.L. 1980. Winter habitat distribution of migratory land birds in western Mexico, with special reference to small foliage-gleaning insectivores, pp. 181–203 in *Migrant birds in the neotropics: ecology, behavior, distribution, and conservation* (A. Keast and E.S. Morton, Eds.). Smithsonian Institution Press, Washington, D.C.
- Kus, B.E. 1999. Impacts of Brown-Headed Cowbird Parasitism on Productivity of the endangered Least Bell's Vireo. *Studies in Avian Biology* 18:160–166.
- Kus, B.E. 2002a. Fitness Consequences of Nest Desertion in an Endangered Host, the Least Bell's Vireo. *The Condor* 104:795–802.
- Kus, B.E. 2002b. Least Bell's Vireo (*Vireo bellii pusillus*). In *California Partners in Flight: The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-Associated Birds in California*. Available: <[http://www.prbo.org/calpif/htmldocs/riparian\\_v-2.html](http://www.prbo.org/calpif/htmldocs/riparian_v-2.html)>. Accessed: April 7, 2006.
- National Geographic. 2002. *Field Guide to the Birds of North America*. (Third Edition.) Page 436. Washington, D.C: National Geographic.
- NatureServe. 2005. *NatureServe Explorer: An Online Encyclopedia of Life [Web Application]*. (Version 4.6.) Available: <<http://www.natureserve.org/explorer>>. Accessed: February 27, 2006.
- Nolan, V. 1960. Breeding Behavior of the Bell Vireo in Southern Indiana. *Condor* 62:225–244.
- Peterson, B.L., B.E. Kus, and D.H. Deutschman. 2004. Determining Nest Predators of the Least Bell's Vireo through Point Counts, Tracking Stations, and Video Photography. *Journal of Field Ornithology* 75(1):89–95.

- Peterson, R.T. 1990. *A Field Guide to Western Birds*. Boston, MA: Houghton-Mifflin Co.
- Roberson, Don. 2004. The Monterey County List - Annotated Checklist and Data Resource. Available at:  
<http://montereybay.com/creagrus/MTYbirdlistportal.html>. Last updated March 5, 2004.
- Santa Clara Valley Water District. 2002. *Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2*. January 2002. San José, CA.
- Santa Clara Valley Water District. 2003. *Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-2 and Section 10(a)(1)(A) Permit No. TE-005878-3*. December 2003. San José, CA.
- Santa Clara Valley Water District. 2004. *Santa Clara Valley Water District Annual Report of Activities: Endangered Species Act Section 10(a)(1)(A) Permit No. TE-005878-3*. December 2004. San José, CA.
- Sibley, D. 2000. *National Audubon Society: The Sibley Guide to Birds*. Page 512. New York, NY: Knopf.
- South Bay Birders Unlimited. 2006. Santa Clara County Year Lists. Available at: <http://www.stanford.edu/~kendric/birds/>. Accessed June 13, 2006.
- Unglish, W.E. 1937. A Few Unusual Records from Central California. *Condor*. Vol. 39 pp. 39-40.
- U.S. Fish and Wildlife Service. 1986. Draft recovery plan for the least Bell's vireo. U.S. Fish and Wildlife Service, Portland, OR. 139 pp.
- U.S. Fish and Wildlife Service. 2005. Songbird Missing from California's Central Coast for 60 years Reappears at San Joaquin River National Wildlife Refuge. Press Release date: June 15, 2005. Available:  
<[http://www.fws.gov/sacramento/ea/news\\_releases/2005%20News%20Releases/LBV\\_rediscover\\_NR.htm](http://www.fws.gov/sacramento/ea/news_releases/2005%20News%20Releases/LBV_rediscover_NR.htm)>.

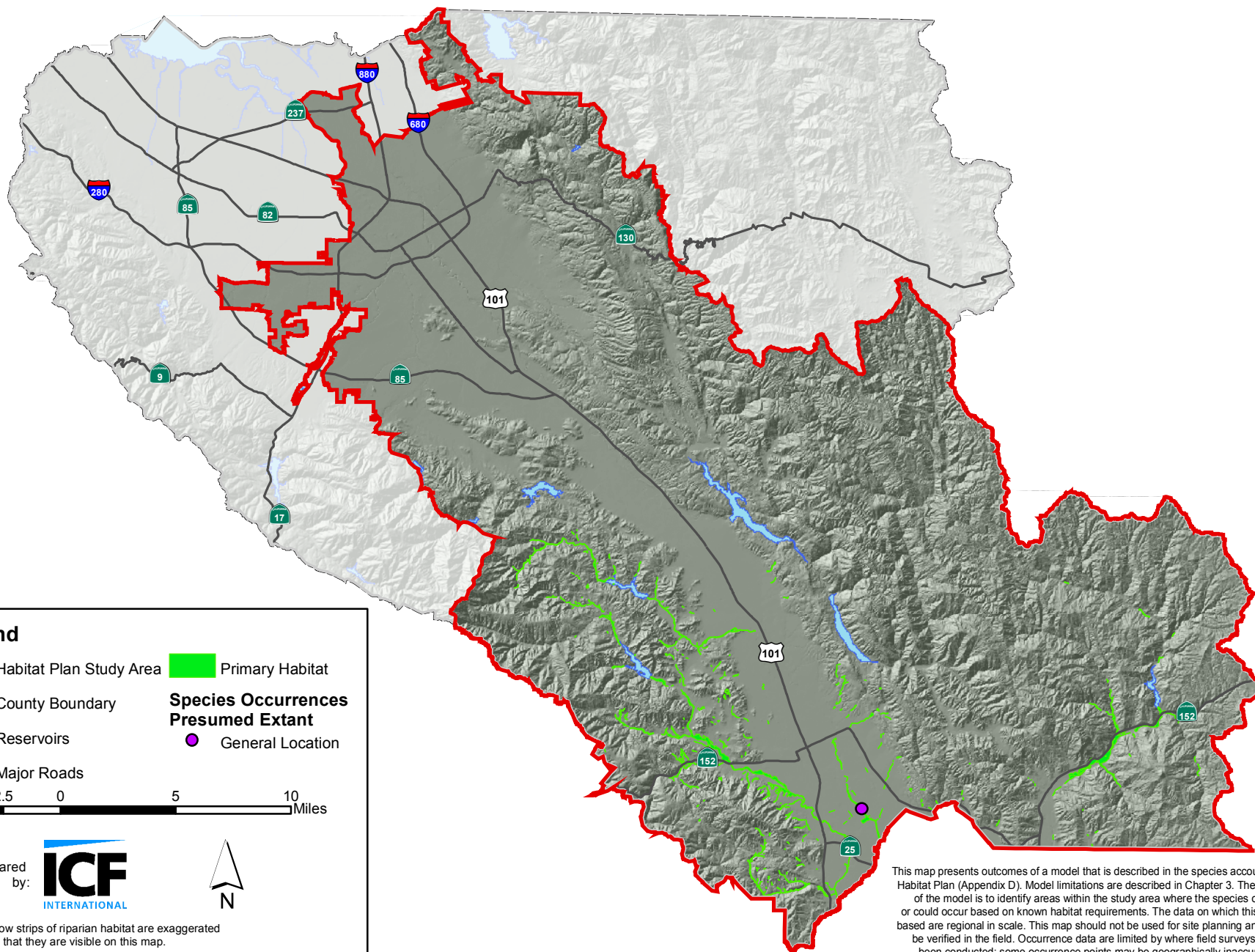
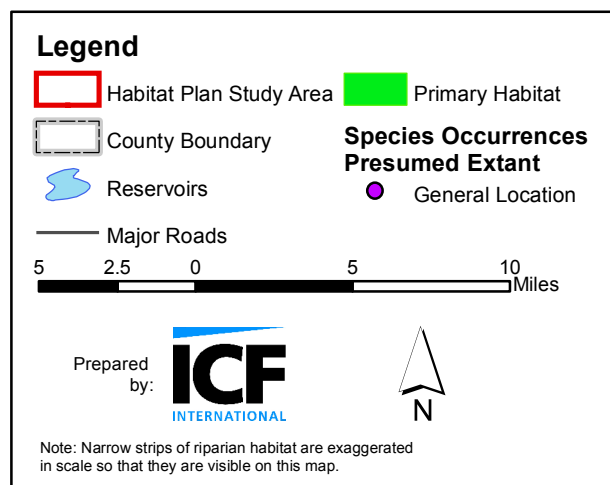
## Personal Communications

- Mammoser, M. Ornithologist that made the observation and posted the sighting on the South Bay Birds list serve. June 20, 2006. Email correspondence with Troy Rahmig.
- Padley, W.D. Biologist with Ecological Services Unit, Watershed Management Operations, Santa Clara Valley Water District. March 19, 2006. Conversation with Troy Rahmig.



**Figure 1**  
**Least Bell's Vireo (*Vireo bellii pusillus*)**  
**Distribution in California**





This map presents outcomes of a model that is described in the species accounts of the Habitat Plan (Appendix D). Model limitations are described in Chapter 3. The purpose of the model is to identify areas within the study area where the species occurs or could occur based on known habitat requirements. The data on which this map is based are regional in scale. This map should not be used for site planning and should be verified in the field. Occurrence data are limited by where field surveys have been conducted; some occurrence points may be geographically inaccurate. See Chapter 3 for occurrence record sources.

**Figure 2**  
**Least Bell's Vireo Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Tricolored Blackbird (*Agelaius tricolor*)

### Legal Status

**State:** Bird Species of Special Concern; meets requirements as a rare, threatened or endangered species under the California Environmental Quality Act (CEQA)

**Federal:** Species of Concern; Migratory Bird Treaty Act

**Critical Habitat:** N/A

**Recovery Planning:** N/A

**Notes:** Change in status during permit period is uncertain



### Taxonomy

Tricolored blackbirds are endemic to the west coast of North America and primarily to California. Though individuals move and utilize different habitats within the region, depending on time of year, long distance migration has not been verified in this species. Banding studies by Neff (1942), DeHaven and Neff (1973), and DeHaven et al. (1975b) indicated that banding returns from tricolored blackbird (*Agelaius tricolor*) populations breeding in southern California from Santa Barbara County south to Baja California and east to the Sonoran desert were not from outside of this area. Songs of male tricolored blackbirds are not regionally distinguishable, unlike those of some red-winged blackbird populations in California (Collier 1968). No subspecies are currently recognized (American Ornithologists Union 1957; Pyle 1997). Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (e.g., Peterson 1990; Sibley 2000; National Geographic 2002).

### Distribution

#### General

Tricolored blackbirds are largely endemic to California, and more than 99% of the global population occurs in the state (Beedy and Hamilton 1999). In any given year, more than 75% of the breeding population can be found in the Central Valley (Hamilton 2000). Small breeding populations also exist at scattered sites in Oregon, Washington, Nevada, and the western coast of Baja California (Beedy and Hamilton 1999) (Figure 1).

The species' historical breeding range in California included the Sacramento and San Joaquin Valleys, lowlands of the Sierra Nevada south to Kern County, the coast region from Sonoma County to the Mexican border, and sporadically on the Modoc Plateau (Dawson 1923; Neff 1937; Grinnell and Miller 1944).

## Occurrences within the Study Area

### Historical

Tricolored blackbirds have been present consistently in Santa Clara County, though their distribution has remained sporadic and ephemeral. A summary of early documentation of the species is summarized by Bousman (2007). Reports about the distribution of this species in Santa Clara County during the 20<sup>th</sup> century were of a rare and uncommon resident and included only occasional reports of small local colonies (Bousman 2007). During data collection for the Santa Clara County Breeding Bird Atlas from 1987–1993, tricolored blackbirds were recorded in 29 (17%) of atlas blocks, and breeding was confirmed in 15 of those blocks (Bousman 2007). In 1989 three colonies were documented in the county. These colonies ranged from 200–700 breeding individuals. Colony nest success was unknown for two of the colonies, and the third was abandoned in late April (California Natural Diversity Database 2006).

### Recent

There are a few documented colonies within the study area and perhaps others that have gone undocumented. In 1996, a colony of 300–500 individuals was documented just outside the study area in the San Antonio Valley, but colony success was unknown (California Natural Diversity Database 2006). During a 2004 survey coordinated by the Central Valley Bird Club, the one historical occurrence of breeding tricolored blackbirds within the county did not support a colony (Green and Edson 2004). In 2006, a breeding colony of approximately 200 individuals was documented within the city limits of Morgan Hill (T. Rahmig pers. obs.). That colony was smaller in 2007 (~150 individuals) and absent during a 2008 statewide survey coordinated by California Audubon (B. Powers pers. comm.).

Tricolored blackbirds are considered “itinerant breeders” (i.e., nomadic breeders) where individuals or colonies can breed in different regions within the same year (Hamilton 1998; Hamilton 2004). Because this species wanders considerably during the breeding season, individuals could successfully breed within the study area if suitable breeding and/or foraging habitat were available. Breeding colonies of tricolored blackbirds often go unreported because of their similar appearance to the common red-winged blackbird (*Agelaius phoeniceus*).

## Natural History

### Habitat Requirements

Tricolored blackbirds have three basic requirements for selecting their breeding colony sites: open, accessible water; a protected nesting substrate, including either flooded, thorny, or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony (Hamilton et al. 1995; Beedy and Hamilton 1997, 1999). Almost 93% of the 252 breeding colonies reported by Neff (1937) were in freshwater marshes dominated by cattails and bulrushes (*Schoenoplectus* spp.). The remaining colonies in Neff's study were in willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), or nettles (*Urtica* spp.). In contrast, only 53% of the colonies reported during the 1970s were in cattails and bulrushes (DeHaven et al. 1975a).

An increasing percentage of tricolored blackbird colonies in the 1980s and 1990s were reported in Himalayan blackberries (*Rubus discolor*) (Cook 1996), and some of the largest recent colonies have been in silage and grain fields (Hamilton et al. 1995; Beedy and Hamilton 1997; Hamilton 2000). Other substrates where tricolored blackbirds have been observed nesting include giant cane (*Arundo donax*), safflower (*Carthamus tinctorius*) (DeHaven et al. 1975a), tamarisk trees (*Tamarix* spp.), elderberry/poison oak (*Sambucus* spp. and *Toxicodendron diversilobum*), and riparian scrublands and forests (e.g., *Salix*, *Populus*, *Fraxinus*) (Beedy and Hamilton 1999).

Ideal foraging conditions for tricolored blackbirds are created when shallow flood-irrigation, mowing, or grazing keeps the vegetation at an optimal height (<15 cm) (Tricolored Blackbird Working Group 2007). Preferred foraging habitats include agricultural crops such as rice, alfalfa, irrigated pastures, and ripening or cut grain fields (e.g., oats wheat, silage, and rice), as well as annual grasslands, cattle feedlots, and dairies. Tricolored blackbirds also forage in remnant native habitats, including wet and dry vernal pools and other seasonal wetlands, riparian scrub habitats, and open marsh borders (Tricolored Blackbird Working Group 2007).



**Table 1.** Habitat Associations for Tricolored Blackbird

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Wetland	Breeding	Primary	Cattails, bulrushes, willows, Himalayan blackberries (recent shift), thistles, nettles, and other spiny or thorny plants	Beedy and Hamilton 1999
Riparian	Breeding	Primary	Riparian woodland and scrub	Beedy and Hamilton 1999
Agricultural	Foraging	Secondary	Open pastures, silage, grain fields, mowed alfalfa, pastures, dairies	Beedy and Hamilton 1999
Herbaceous dominated	Foraging	Secondary	Native and nonnative annual grasslands	Beedy and Hamilton 1999

## Reproduction

Tricolored blackbirds are closely related to red-winged blackbirds, but the two species differ substantially in their breeding ecology. Red-winged blackbird pairs defend individual territories, while tricolored blackbirds are among the most colonial of North American passerine birds (Bent 1958; Orians 1961a, 1961b, 1980; Orians and Collier 1963; Payne 1969; Beedy and Hamilton 1999). As many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 4 hectares (9 acres) or less (Neff 1937; DeHaven et al. 1975a), and individual nests may be built less than 0.5 meter (1.5 feet) apart (Neff 1937). Tricolored blackbird's colonial breeding system may have adapted to exploit a rapidly changing environment where the locations of secure nesting habitat and rich insect food supplies were ephemeral and likely to change each year (Orians 1961a; Orians and Collier 1963; Collier 1968; Payne 1969).

**Table 2.** Key Seasonal Periods for tricolored blackbird

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Colony Formation			✓	✓	✓							
Breeding			✓	✓	✓	✓	✓					
Migration			✓	✓	✓	✓	✓	✓	✓	✓		
Molting							✓	✓	✓	✓		

Source: Beedy and Hamilton 1999.

## Movement

During the breeding season, tricolored blackbirds exhibit itinerant breeding, commonly moving to different breeding sites each season (Hamilton 1998). In the northern Central Valley and northeastern California, individuals move after

their first nesting attempts, whether successful or unsuccessful (Beedy and Hamilton 1997). Banding studies indicate that significant movement into the Sacramento Valley occurs during the post-breeding period (DeHaven et al. 1975b).

During winter, virtually the entire population withdraws from Washington, Oregon (although a few remain), Nevada, and Baja California, and wintering populations shift extensively within their breeding range in California (Beedy and Hamilton 1999). Numbers of tricolored blackbirds decrease in the Sacramento Valley and increase in the Sacramento–San Joaquin River Delta and northern San Joaquin Valley (Neff 1937; Orians 1961a; Payne 1969; DeHaven et al. 1975b). By late October, large flocks also congregate in pasturelands in southern Solano County and near dairies on Point Reyes Peninsula in Marin County (Beedy and Hamilton 1999). Other birds winter in the central and southern San Joaquin Valley. Concentrations of more than 15,000 wintering tricolored blackbirds may gather at one location and disperse up to 32 kilometers (20 miles) to forage (Neff 1937; Beedy and Hamilton 1999). Individual birds may leave winter roost sites after less than three weeks and move to other locations (Collier 1968), suggesting winter turnover and mobility. In early March and April, most birds vacate the wintering areas in the Central Valley and along the coast and move to breeding locations in the Sacramento and San Joaquin Valleys (DeHaven et al. 1975b).

**Table 3.** Movement Distances for Tricolored Blackbird

Type	Distance/Area	Location of Study	Citation
Male territory (within colony)	20–35 square feet (0.8–3.25 m <sup>2</sup> )	California	Lack and Emlen 1939, Orians 1961a
Dispersal	33% recovered within 10 miles (16 km) of natal colonies	California	DeHaven et al 1975b
Home range	May range widely in flocks to over 9 miles (15 km) from active colony	California	Beedy and Hamilton 1999

## Ecological Relationships

Tricolored blackbirds occupy a unique niche in the Central Valley/coastal marshland ecosystems. In areas where the number of tricolored blackbirds is high, they are both aggressively and passively dominant to—and often displace—sympatric marsh nesting species, including red-winged and yellow-headed blackbirds (Orians and Collier 1963; Payne 1969). Recently, this species has been documented breeding in silage and rice fields in the Central Valley (Hamilton 2000, 2004).

## Population Status and Trends

**Global:** *Declining* (Beedy and Hamilton 1997, 1999)

**State:** *Declining* (Beedy and Hamilton 1997, 1999)

**Within Study Area:** *Unknown*

The U.S. Fish and Wildlife Service, the California Department of Fish and Game, and California Audubon cosponsored intensive tricolored blackbird surveys (carried out by volunteers in suitable tricolored blackbird surveys in suitable habitats throughout California) in 1994, 1997, 1999, 2000, and 2004 (Hamilton et al. 1995; Beedy and Hamilton 1997; Hamilton 2000, Green and Edson 2004). Local, regional, and statewide tricolored blackbird populations have experienced major declines since 1994. Statewide totals of adults in four late-April surveys covering all recently known colony sites were 369,359 (1994); 237,928 (1997); 104,786 (1999); 162,508 (2000), and >130,000 (low estimate for 2004). Several areas that historically supported large (>2,000 individuals) colonies in the central valley no longer have birds present (Green and Edson 2004; Hamilton 2004). The study area was not adequately surveyed during 2004, but the one historical location did not have any tricolored blackbirds present (Green and Edson 2004).

## Threats

The greatest threats to this species are the direct loss and alteration of habitat; however, other human activities, as well as predation, also threaten tricolored blackbird populations in the Central Valley (Beedy and Hamilton 1999). Most native habitats that once supported nesting and foraging tricolored blackbirds have been altered by urbanization and unsuitable agricultural uses, including vineyards, orchards, and row crops (Frayner et al. 1989; Wilen and Frayer 1990). Many former agricultural areas within the historical range of tricolored blackbirds are now being urbanized. Nests and nest contents in cereal crops and silage are often destroyed by agricultural operations (Hamilton et al. 1995; Beedy and Hamilton 1997). Harvesting of silage and plowing of weedy fields are currently the most common reasons that tricolored blackbird nesting colonies are destroyed in agricultural areas. Other factors that may affect the nesting success of colonies in agricultural areas include herbicide and pesticide applications, and spraying ponds for mosquito abatement (Beedy and Hamilton 1999). A primary reason for limited nesting success in agricultural areas (particularly in rice fields) is predation of fledgling by black-crowned night herons (*Nycticorax nycticorax*) (Hamilton 2004).

## Data Characterization

Statewide surveys were conducted for tricolored blackbirds in California in 1994, 1997, 1999, 2000, and 2004 (Hamilton et al. 1995; Beedy and Hamilton 1997; Hamilton 2000; Green and Edson 2004). Additional surveys include data on local distribution and population trends (Neff 1937; DeHaven et al. 1975a). Because this species is nomadic and exhibits erratic movement behavior, local

occurrence data provides only limited information on long-term small-area use patterns. This species forages and breeds in specific locations of the study area, largely freshwater marshes dominated by cattails or bulrushes, or in areas with suitable willow, blackberry, thistle, or nettle habitat (Beedy and Hamilton 1999).

A moderate amount of literature is available for the tricolored blackbird because it is a highly visible, colonial bird species commonly associated with wetland habitat. Beedy and Hamilton (1999) provide a comprehensive review of information available on general natural history, behavior, distribution and population changes, known demographics and population regulation, and conservation and management. A range-wide management plan was developed in 1997 (Beedy and Hamilton 1997) and the Tricolored Blackbird Working Group is currently developing a conservation plan that is scheduled for release in mid-2006.

## **Existing Conservation Actions in the Study Area**

There are no conservation actions occurring in the study area for tricolored blackbird. Management goals that have been proposed include maintaining a viable self-sustaining population throughout the species' current geographic range; avoiding losses of colonies and their associated habitats; increasing breeding populations on suitable public and private lands managed for this species; and enhancing public awareness and support for protection of habitat and active colonies.

Pond creation and restoration, though typically not initiated to benefit this species, could provide potential breeding habitat if tall dense vegetation (e.g., cattails) are allowed to establish.

A tricolored blackbird conservation plan was prepared by the Tricolored Blackbird Working Group in 2007 (Tricolored Blackbird Working Group 2007).

## **Modeled Species Distribution in Study Area**

### **Model Description**

#### **Model Assumptions**

##### **Primary Habitat—Breeding and Foraging**

Habitats suitable for breeding and foraging during the breeding season were modeled using all riparian woodland and scrub land-cover types, coastal and valley freshwater marsh and ponds within grassland, oak woodland, riparian forest/scrub, grain/row-crop/hay/pasture, and barren land-cover types.

**Secondary Habitat—Foraging and Wintering**

Areas that provide suitable foraging and wintering habitats include seasonal wetlands, all grasslands, and all agricultural land-cover types.

**Rationale**

Tricolored blackbirds historically occurred within the Central Valley associated with emergent freshwater marshes dominated by cattails or bulrushes, with some colonies occurring in willows, blackberries, thistles, and nettles associated with sloughs and natural channels (Neff 1937). More recent colonies have been observed in a diversity of upland and agricultural areas (Collier 1968; Cook 1996; Hamilton 2004), riparian scrublands and woodlands (Orians 1961a; DeHaven et al 1975a; Beedy et al. 1991; Hamilton et al. 1995; Beedy and Hamilton 1999).

Small breeding colonies have been documented at public and private lakes, reservoirs, and parks surrounded by shopping centers, subdivisions, and other urban development. Adults from these colonies generally forage in nearby undeveloped upland areas. Beedy and Hamilton (1999) predict that these small, urban wetlands and upland foraging habitats may continue to accommodate tricolored blackbirds in the future unless they are eliminated entirely by development. High-quality foraging areas include irrigated pastures, lightly grazed grasslands, dry seasonal pools, mowed alfalfa fields feedlots, and dairies (Beedy and Hamilton 1999). Lower quality foraging habitats include cultivated row crops, orchards, vineyards, and heavily grazed rangelands.

**Model Results**

Figure 2 shows the modeled potential habitat for the tricolored blackbird within the study area. Primary habitat is limited within the study area and it should be noted that by including all riparian areas the available breeding habitat is likely overestimated. Breeding habitat will actually be limited to small ponds/wetlands that occur in slow water portions of these riparian corridors. Secondary (foraging) habitat is prevalent throughout the valley floor and in the low elevations of the surrounding hills.

**Literature Cited**

American Ornithologists Union. 1957. *Check-List of North American Birds*. (5th ed.) Washington D.C: American Ornithologists Union.

Beedy, E.C. and W.J. Hamilton III. 1997. *Tricolored Blackbird Status Update and Management Guidelines*. Jones & Stokes Associates, Inc. (JSA 97-099.) Sacramento, CA. Prepared for U.S. Fish and Wildlife Service, Portland, OR; and California Department of Fish and Game, Sacramento, CA.

- . 1999. Tricolored Blackbird (*Agelaius tricolor*). In A. Poole and F. Gill (eds.), *The Birds of North America*, No. 423. Philadelphia, PA: The Birds of North America, Inc.
- Bent, A.C. 1958. Life Histories of North American Blackbirds, Orioles, Tanagers, and Their Allies. *U.S. National Museum Bulletin* 211.
- Bousman, W.G. 2007. Breeding Bird Atlas of Santa Clara County, California. Santa Clara Valley Audubon Society. Cupertino, CA. 547 pp.
- California Department of Fish and Game. 2005. *California Bird Species of Special Concern*. Last revised May 2, 2003. Available: <<http://www.dfg.ca.gov/hcpb/species/ssc/sscbird/sscbird.shtml>>. Accessed: February 21, 2006.
- California Natural Diversity Database. 2006. RareFind, Version 3.0.5 (Updated March 31, 2006). Sacramento, CA: California Department of Fish and Game.
- Collier, G. 1968. *Annual Cycle and Behavioral Relationships in the Red-Winged and Tricolored Blackbirds of Southern California*. Ph.D. dissertation. University of California. Los Angeles, CA.
- Cook, L. 1996. *Nesting Adaptations of Tricolored Blackbirds* (*Agelaius tricolor*). Master's thesis. University of California. Davis, CA.
- Dawson, W.L. 1923. *The Birds of California: Volume I*. San Francisco: South Moulton Company.
- DeHaven, R.W., and J.A. Neff. 1973. Recoveries and Returns of Tricolored Blackbirds, 1941–1964. *Western Bird Bander* 48:10–11.
- DeHaven R.W., F.T. Crase, and P.P. Woronecki. 1975a. Breeding Status of the Tricolored Blackbird, 1969–1972. California Department of Fish and Game.
- . 1975b. Movements of Tricolored Blackbirds Banded in the Central Valley of California, 1965–1972. *Bird-Banding* 46:220–229.
- Frayser, W.E., D.D. Peters, and H.R. Pywell. 1989. *Wetlands of the California Central Valley: Status and Trends—1939 to mid-1980s*. Portland, OR: U.S. Fish and Wildlife Service, Region 1.
- Green, M. and L. Edson. 2004. The 2004 Tricolored Blackbird April Survey. Central Valley Bird Club Bulletin. Volume 7, Numbers 2–3.
- Grinnell, J., and A.H. Miller. 1944. The Distribution of the Birds of California. *Pacific Coast Avifauna* No. 27.

- Hamilton, W.J., III, L. Cook, and R. Grey. 1995. *Tricolored Blackbird Project 1994*. Unpublished report. Prepared for U.S. Fish and Wildlife Service, Portland, OR.
- Hamilton, W.J., III. 1998. Tricolored Blackbird Itinerant Breeding in California. *Condor* 100:218B226.
- . 2000. Tricolored Blackbird 2000 Survey and Population Analysis. Unpublished report. Prepared for U.S. Fish and Wildlife Service, Portland, OR.
- . 2004. Management Implications of the 2004 Tricolored Blackbird Survey. Central Valley Bird Club Bulletin. Volume 7, Numbers 2–3.
- Lack, D., and J.T. Emlen. 1939. Observations on Breeding Behavior in Tricolored Red-Wings. *Condor* 41: 225–230.
- National Geographic. 2002. *National Geographic: Field Guide to the Birds of North America*. (Third Edition.) Page 436. Washington D.C: National Geographic.
- Neff, J.A. 1937. Nesting Distribution of the Tricolored Red-Wing. *Condor* 39:61–81.
- . 1942. Migration of the Tricolored Red-Wing in Central California. *Condor* 44:45–53.
- Orians, G.H. 1961a. The Ecology of Blackbird (*Agelaius*) Social Systems. *Ecological Monographs* 31:285–312.
- . 1961b. Social Stimulation within Blackbird Colonies. *Condor* 63: 330–337.
- . 1980. Some Adaptations of Marsh-Nesting Blackbirds. In *Monographs in Population Biology*. Princeton, NJ: Princeton University Press.
- Orians, G.H. and G. Collier. 1963. Competition and Blackbird Social Systems. *Evolution* 17:449–459.
- Payne, R. 1969. Breeding Seasons and Reproductive Physiology of Tricolored Blackbirds and Red-Winged Blackbirds. *Univ. Calif. Publ. Zool.* 90:1–137.
- Peterson, R.T. 1990. *A Field Guide to Western Birds*. Boston, MA: Houghton-Mifflin Co.
- Pyle, P. 1997. *Identification Guide to North American Birds, Part I*. Bolinas, CA: Slate Creek Press.
- Shuford, W.D. and T. Gardali (eds). 2008. California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct

Populations of Birds of Immediate Conservation Concern in California.  
*Studies of Western Birds* 1:1–450.

Sibley, D. 2000. *National Audubon Society: The Sibley Guide to Birds*. Page 512. New York, NY: Knopf.

Tricolored Blackbird Working Group. 2007. *Conservation Plan for the Tricolored Blackbird* (*Agelaius tricolor*). Susan Kester (ed). Sustainable Conservation. San Francisco, CA.

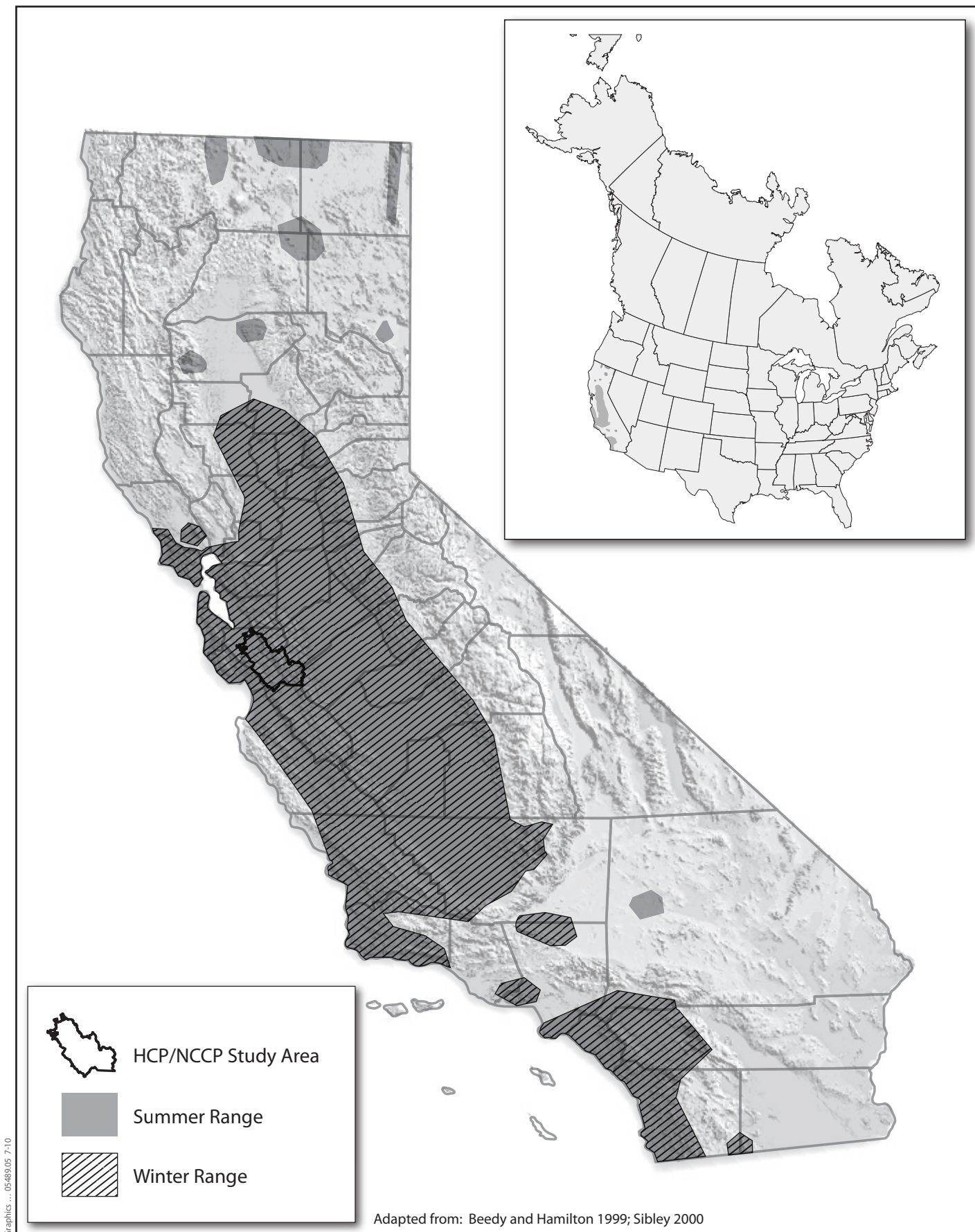
Wilen, B.O., and W.E. Frayer. 1990. Status and Trends of United States Wetlands and Deepwater Habitats. *Forest Ecology Management* 33:181–192.

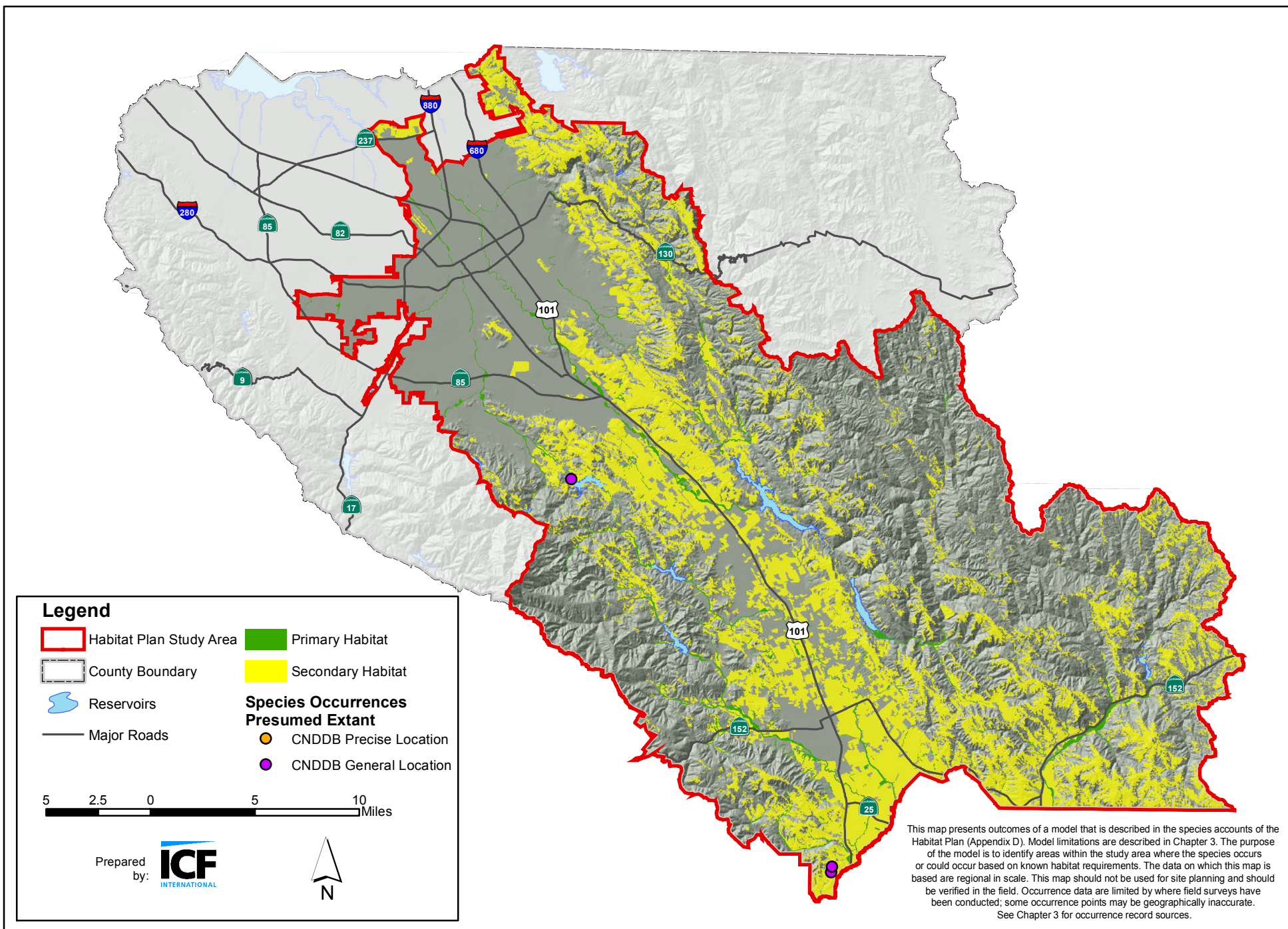
## Personal Communications

Powers, B. Executive Director. Santa Clara Valley Audubon Society.  
Conversation with Troy Rahmig, Jones and Stokes, and data submittal to California Audubon Society.









**Figure 2**  
**Tricolored Blackbird Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**



## San Joaquin Kit Fox (*Vulpes macrotis mutica*)

### Legal Status

**State:** Threatened

**Federal:** Endangered

**Critical Habitat:**

**Recovery Planning:** *Recovery*

*Plan for Upland*

*Species of the San Joaquin Valley, California*

(U.S. Fish and Wildlife Service 1998)

**Notes:** Status not anticipated to change during permit term.



Dr. Lloyd Glenn Ingles  
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### Taxonomy

The San Joaquin kit fox is a subspecies of the kit fox (*Vulpes macrotis*), the smallest member of the dog family in North America. Though there has been some debate as to the taxonomic relationship among North American arid land foxes, the San Joaquin kit fox remains a distinct subspecies due to its limited range in California. The details of this debate are outlined in Dragoo et al. (1990) and Schwartz et al. (2005). Descriptions of the species' physical characteristics can be found in McGrew (1979) and U.S. Fish and Wildlife Service (1998).

### Distribution

#### General

Currently, kit foxes occur in some areas of suitable habitat on the floor of the San Joaquin Valley and in the surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains from Kern County north to Contra Costa, Alameda, and San Joaquin Counties (U.S. Fish and Wildlife Service 1998) (Figure 1). There are known occurrences in Alameda, Contra Costa, Fresno, Kern, Kings, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Stanislaus, and Tulare Counties (California Natural Diversity Database 2006). The largest extant populations of kit fox are in Kern County (Elk Hills and Buena Vista Valley) and San Luis Obispo County in the Carrizo Plain Natural Area (U.S. Fish and Wildlife Service 1998).

## Occurrences within the Study Area

### Historical

Although the precise historical range of San Joaquin kit fox is unknown, it is believed to have extended from Contra Costa and San Joaquin Counties in the north to Kern County in the south. By the 1930s, the range had been reduced to the southern and western portions of the Central Valley (Grinnell et al. 1937). Surveys conducted between 1969 and 1975 extended the known range of the kit fox back into portions of its historical range in the northern San Joaquin Valley, including Contra Costa, Alameda, and San Joaquin Counties (Orloff et al. 1986). At this time, kit foxes were also found in three counties outside the originally defined historical range: Monterey, Santa Clara, and Santa Barbara counties (Orloff et al. 1986).

### Recent

There are four occurrences on record from 1972–2002 for the San Joaquin kit fox in Santa Clara County (California Natural Diversity Database 2006, U.S. Fish and Wildlife Service 2006). Of those records, two are based on observation of individuals and two are derived from San Joaquin kit fox range maps from 1972–1975. The two occurrences from the 1970's are not included here due to a lack of precision and because they are based on kit fox range maps and not actual observations. In 1992 a den site was found with two surviving pups (though the adult female had apparently been killed). The best description of the location of this den site is very general, stating that it is from Hollister north to Gilroy. It is included here simply as a placeholder and to acknowledge that habitat potential may exist in this area. The second observation (2002) was of a lone individual during the fall dispersal period in Henry Coe State Park (California Natural Diversity Database 2006). A third observation, which is not in the CNDDDB, was of a road kill kit fox over six miles south of the Highway 152/156 junction (U.S. Fish and Wildlife Service 2006). This occurrence falls just outside of the study area.

Genetic studies have shown that individuals from the San Luis Reservoir population, southeast of the study area, interbreed with individuals from Alameda and Contra Costa Counties (Schwartz et al. 2000 in U.S. Fish and Wildlife Service 2006). It is assumed (U.S. Fish and Wildlife Service 2006) that the Pacheco-Santa Ana watershed in the southeastern part of Santa Clara County provides movement habitat between these two areas. In the recovery plan for this species the U.S. Fish and Wildlife Service restricts the range in Santa Clara County to the Pajaro River watershed (U.S. Fish and Wildlife Service 1998).

## Natural History

### Habitat Requirements

San Joaquin kit foxes occur in a variety of habitats, including grasslands, scrublands, vernal pool areas, alkali meadows and playas, and an agricultural matrix of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands (U.S. Fish and Wildlife Service 1998). They prefer habitats with loose-textured soils (Grinnell et al. 1937; Egoscue 1962) that are suitable for digging, but they occur on virtually every soil type. Dens are generally located in open areas with grass or grass and scattered brush, and seldom occur in areas with thick brush. Preferred sites are relatively flat, well-drained terrain (U.S. Fish and Wildlife Service 1998, Roderick and Mathews 1999). They are seldom found in areas with shallow soils due to high water tables or impenetrable bedrock or hardpan layers (O'Farrell and Gilbertson 1979; O'Farrell et al. 1980). However, kit foxes may occupy soils with a high clay content where they can modify burrow dug by other animals, such as California ground squirrels (*Spermophilus beecheyi*) (Orloff et al. 1986).

In the northern part of its range (including San Joaquin, Alameda, and Contra Costa Counties) where most habitat on the valley floor has been eliminated, kit foxes now occur primarily in foothill grasslands (Swick 1973; Hall 1983; U.S. Fish and Wildlife Service 1998), valley oak savanna, and alkali grasslands (Bell 1994). Less frequently they occur adjacent to and forage in tilled and fallow fields and irrigated row crops (Bell 1994). These foxes will den within small parcels of native habitat that are surrounded by intensively maintained agricultural lands (Knapp 1978) and adjacent to dryland farms (Jensen 1972; Orloff et al. 1986; U.S. Fish and Wildlife Service 1998).

The diet of kit foxes varies, with season and geographic locality based on local availability of potential prey. In the northern portion of their range, kit foxes most commonly prey on California ground squirrels, cottontails (*Sylvilagus auduboni*), black-tail jackrabbits (*Lepus californicus*), pocket mice (*Perognathus* spp.), and kangaroo rats (*Dipodomys* spp.) (Hall 1983; Orloff et al. 1986; U.S. Fish and Wildlife Service et al. 1998). Secondary prey taken opportunistically may include ground-nesting birds, reptiles, and insects (Laughlin 1970).

**Table 1.** Habitat Associations for San Joaquin Kit Fox

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Grassland	Breeding, foraging, movement	Primary	Requires suitable burrows for denning, primarily provided by ground squirrels in the northern portion of the kit fox geographic range. Must be managed to maintain low vegetation height	Low vegetation is thought to provide clear view of potential predators. Presence of burrowing species provides burrows for refugia and a substantial prey base.
Agricultural	Foraging and movement	Secondary, Movement	Improves with the presence of suitable prey.	Periodic disking renders this type of habitat as unsuitable for denning and for some prey species.

Sources: Orloff et al. 1986; U.S. Fish and Wildlife Service 1998.

## Reproduction

Kit foxes can, but do not necessarily, breed their first year. Sometime between February and late March, two to six pups are born per litter (Zoellick et al. 1987; Cypher et al. 2000). The annual reproductive success for adults can range between 20% and 100% (mean: 61%;) and 0 and 100% for juveniles (mean: 18%) (Cypher et al. 2000). Population growth rates generally vary positively with reproductive success and kit fox density is often positively related to both current and the previous year's prey availability (Cypher et al. 2000). Prey abundance is generally strongly related to the previous year's effective (October to May) precipitation.

**Table 2.** Key Seasonal Periods for San Joaquin Kit Fox

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Mating and Conception	✓	✓										
Litters Born		✓	✓									
Rearing (pupping)				✓	✓	✓	✓					
Dispersal							✓	✓	✓			
Denning	✓	✓	✓							✓	✓	✓

Sources: U.S. Fish and Wildlife Service 1998; Koopman et al. 2000.

## Movement

Kit foxes may range up to 20 miles at night during the breeding season and somewhat less (6 miles) during the pup-rearing season (Girard 2001). The species can readily navigate a matrix of land use types. Home ranges vary from less than one square mile up to approximately 12 square miles (Knapp 1978;

Spiegel and Bradbury 1992; White and Ralls 1993). The home ranges of pairs or family groups of kit foxes generally do not overlap (White and Ralls 1993). This behavior may be an adaptation to periodic drought-induced scarcity in prey abundance.

**Table 3.** Movement Distances for San Joaquin Kit Fox

Type	Distance/Area	Location of Study	Citation
Home range	In some cases less than 1 m <sup>2</sup> (2.6 km <sup>2</sup> ) but generally approx. 2 m <sup>2</sup> (3.1 km <sup>2</sup> ) up to 12 m <sup>2</sup> (31.2 km <sup>2</sup> )	Multiple areas	Morrell 1972, Knapp 1978, Zoellick et al. 1987, Speigal & Bradbury 1992, White and Ralls 1993
Dispersal	Variable, 5.0±0.9 miles (8±1.4 km) up to ~74 miles	Elk Hills near Taft	Scrivner et al. 1987

## Ecological Relationships

San Joaquin kit foxes prey upon a variety of small mammals, ground-nesting birds, and insects. They are in turn subject to predation by such species as coyote, non-native red foxes, domestic dog, eagles, and large hawks (Hall 1983; Berry et al. 1987; Ralls and White 1995). White et al. (2000) determined that coyotes were responsible for 59% of kit fox deaths during a 4-year telemetry study at Camp Roberts in southern Monterey County.

## Population Status and Trends

**Global:** *Declining*

(NatureServe 2006; California Department of Fish and Game 2005)

**State:** *Same as above*

**Within Study Area:** *Unknown due to lack of data*

Although the San Joaquin kit fox is known to occur within the study area, information on the extent of its range is very limited (California Natural Diversity Database 2006). Compared with populations in the southern San Joaquin Valley, little is known about the ecology and habitat needs of kit foxes in the northern part of their range. Researchers have consistently indicated that the behavioral ecology of kit foxes in this region is poorly known and may be different from the ecology of foxes in the southern part of their range (Laughrin 1970; Swick 1973; Morrell 1975; Orloff et al. 1986; Sproul and Flett 1993; Bell 1994). The northern populations of kit foxes appear to use different prey (ground squirrels instead of kangaroo rats), and their denning habitat appears different (Orloff et al. 1986). In addition, habitat features such as ground cover, dominant vegetation, land use practices, rainfall, and in some cases slope, is substantially different in the north than in the south, where kit foxes are more abundant and well studied. Because of these differences, geographic differences may exist in



the demographic characteristics of these populations. However, the threats to the species are likely to be comparable in both regions of their range.

## Threats

Continued fragmentation of habitat is a serious threat to this species. Increasing isolation of populations through habitat degradation and barriers to movement, such as aqueducts and busy highways, can limit dispersal to and occupancy of existing and former lands. The threat of being struck by vehicles is high, particularly for dispersing individuals.

Habitat alteration also represents a threat to this species. This is known to result from oil extraction and mining activities, changes in wildlife prevalence, and changes in vegetation structure due to nonnative species and altered grazing regimes (U.S. Fish and Wildlife Service 2010). Livestock grazing is not thought to be necessarily detrimental to the kit fox (Morrell 1975; Orloff et al. 1986), but it may affect the number of prey species available, depending on the intensity of grazing (U.S. Fish and Wildlife Service 1998). Moderate grazing is thought to benefit the species because it can potentially enhance the prey base and reduce vegetation to allow kit fox to more easily detect and avoid predators. The use of pesticides to control rodents and other pests also threatens kit fox in some areas, either directly through poisoning or indirectly through reduction of prey abundance.

## Data Characterization

There are 16 occurrences on record from 1973–2004 for the San Joaquin kit fox in the three-county region that includes Santa Clara, Alameda, and Stanislaus Counties. Four of those records are within the HCP/NCCP study area but only two were verified. A moderate amount of literature is available for the San Joaquin kit fox because of its state threatened and federally endangered status. While numerous surveys have been conducted in the southern portion of the range, very few surveys or studies have been conducted within the northern portion of its range or in the study area. Quantitative data are available on population size, reproductive capacity, mortality, dispersal, home-range movement patterns, and habitat characteristics and requirements. A number of models have been developed to describe the species' population dynamics. Because there are few sightings within the HCP/NCCP study area and the area has been under surveyed, it is assumed that trends within the study area are consistent with those documented for the northern range of the species.

## Existing Conservation Actions in the Study Area

In 1998, a recovery plan for upland species of the San Joaquin Valley was completed (U.S. Fish and Wildlife Service 1998) that included a revised recovery strategy for the San Joaquin kit fox. The goal of this recovery plan is to maintain

a viable metapopulation of kit foxes on private and public lands throughout the plan's geographic range. No conservation areas were identified from within the HCP/NCCP study area for this species in the 1998 recovery plan or in a subsequent reserve design analysis for the entire range of the species (Haight et al. 2004). However, the recovery plan identifies the protection of existing kit fox habitat in the northern portion of its range and protection of existing connections between suitable habitat and primary recovery areas.

The Nature Conservancy's Mount Hamilton Project includes land preservation throughout the southeastern portion of the study area. One of their target species for conservation is the San Joaquin kit fox.

## Modeled Species Distribution in Study Area

### Model Description

Only movement and foraging habitat was identified within the study area for this species. It is denoted on Figure 2 as secondary habitat though this has been identified as a possible movement corridor between breeding populations.

### Model Assumptions

#### Secondary Habitat—Movement and Foraging

All grassland land cover types and seasonal wetlands and ruderal areas that are adjacent to grasslands were considered suitable movement and foraging habitat for this species. Further, valley oak/grasslands, blue oak woodland, and coast live oak woodlands within 500-feet of suitable grasslands were also considered suitable movement and foraging habitat. These parameters were only considered suitable habitat within the Pacheco and South Santa Clara Valley watersheds. Small fragments of habitat that were disconnected from contiguous habitat blocks were removed from the results to better represent actual movement potential for the species.

#### Secondary Habitat—Low-Use Movement

Areas that the San Joaquin kit fox may use occasionally for movement include orchards, golf courses/urban parks, and ruderal areas that are connected to movement and foraging habitat described above. These were intended to represent areas that individuals might pass through while moving between other more suitable habitat types.

### Rationale

In the northern part of its range the San Joaquin kit fox now occurs primarily in foothill grasslands (Swick 1973; Hall 1983; U.S. Fish and Wildlife Service 1998), valley oak savanna and alkali grasslands (Bell 1994). They prefer habitats

with loose-textured soils (Grinnell et al. 1937; Hall 1946; Morrell 1972), suitable for digging, but occur on virtually every soil type. It has been established that individuals from the San Luis Reservoir population interbreed with individuals from Alameda and Contra Costa Counties, north of the study area, leading experts to believe that southern Santa Clara County may be a movement corridor between these two areas. This habitat model was based on that assumption and habitat that is shown in Figure 2 should be considered low-use secondary habitat.

## Model Results

Figure 2 shows the modeled potential habitat of the San Joaquin kit fox within the Santa Clara Valley HCP/NCCP study area. The habitat includes only the southeastern portion of the study area and is primarily located on private lands south of Henry Coe State Park. Since there are so few documented occurrences of the kit fox from within the study area it is difficult to state what the accuracy of the model is relative to actual presence of the species.

## Literature Cited

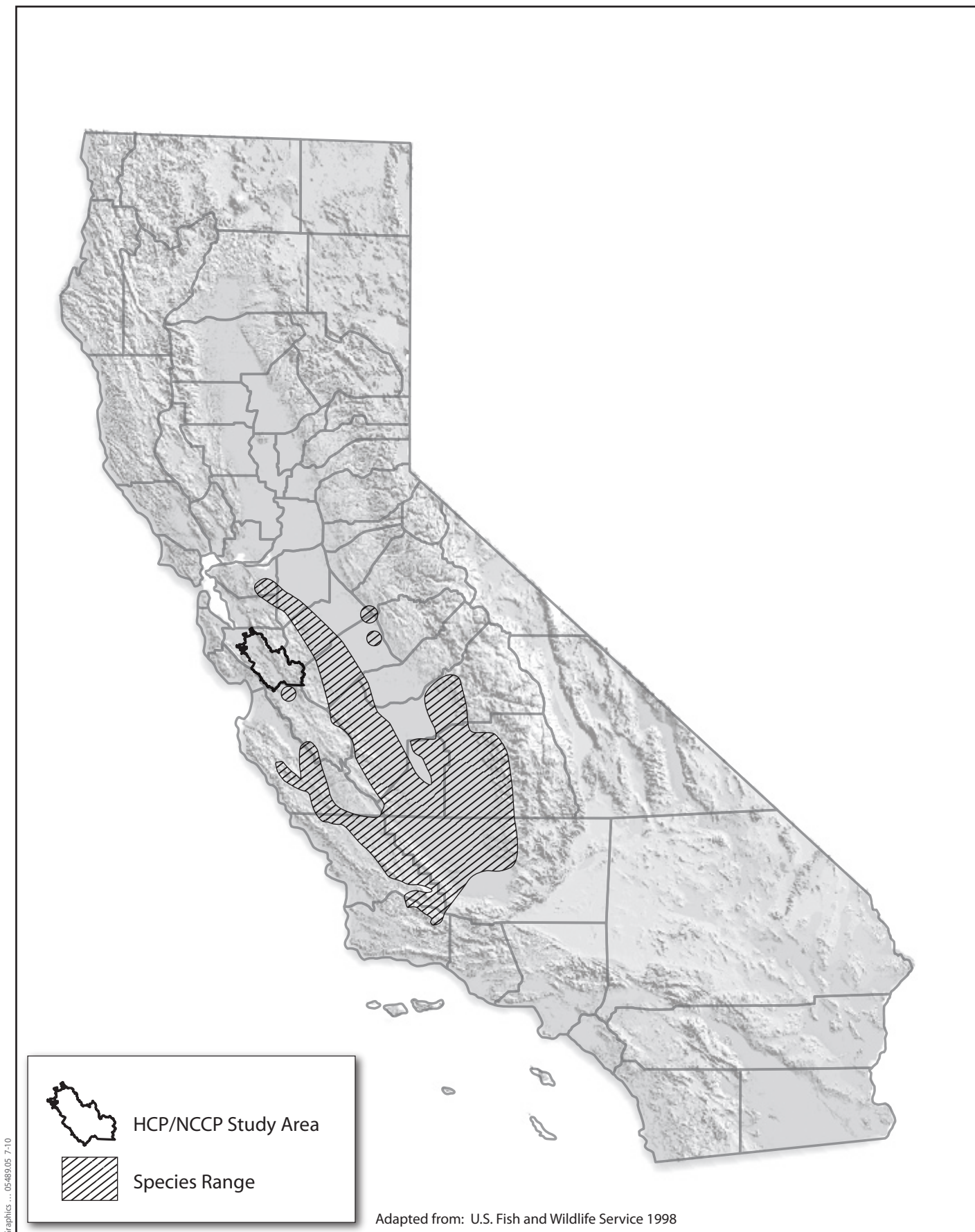
- Bell, H. 1994. *Analysis of Habitat Characteristics of San Joaquin Kit Fox in Its Northern Range*. Master's Thesis, California State University, Hayward.
- Berry, W.H., J.H. Scrivner, T.P. O'Farrell, C.E. Harris, R.T. Kato, and P.M. McCue. 1987. *Sources and Rates of Mortality of the San Joaquin Kit Fox, Naval Petroleum Reserve #1, Kern County, California, 1980–1986*. U.S. Department of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. EGG 10282-2145. 34 pp.
- California Department of Fish and Game. 2005. *The Status of Rare, Threatened, and Endangered Plants and Animals of California 2000–2004*.
- California Natural Diversity Database. 2006. RareFind, Version 3.0.5 (Updated March 31, 2006). Sacramento, CA: California Department of Fish and Game.
- Cypher, B.L., G.D. Warrick, M.R.M. Otten, T.P. O'Farrell, W.H. Berry, C.E. Harris, T.T. Kato, P.M. McCue, J.H. Scrivner, B.W. Zoellick. 2000. Population Dynamics of San Joaquin Kit Foxes at the Naval Petroleum Reserves in California. *Wildlife Monographs* 145:1–43.
- Dragoo, J.R., J.R. Choate, T.L. Yates, and T.P. O'Farrell. 1990. Evolutionary and Taxonomic Relationships among North American Arid-Land Foxes. *Journal of Mammalogy*. 71(3):318–332.
- Egoscue, H.J. 1962. Ecology and Life History of the Kit Fox in Tooele County, Utah. *Ecology* 43:481–497.

- Girard, I. 2001. Field Cost of Activity in the Kit Fox, *Vulpes macrotis*. *Physiological and Biochemical Zoology* 74(2):191–202.
- Grinnell, J., J.S. Dixon, and J.M. Linsdale. 1937. *Fur-Bearing Mammals of California*. Univ. California Press, Berkeley. Vol. 2, xiv + 377–777.
- Haight, R.G., B. Cypher, P.A. Kelly, S. Phillips, K. Ralls, and H.P. Possingham. 2004. Optimizing reserve expansion for disjunct populations of San Joaquin kit fox. *Biological Conservation* 117: 61–72.
- Hall, E.R. 1946. *Mammals of Nevada*. Univ. California Press, Berkeley. xi + 710 pp.
- Hall, Jr., F.A. 1983. *Status of the San Joaquin Kit Fox, Vulpes macrotis mutica, at the Bethany Wind Turbine Generating Project Site, Alameda County, California*. California Department of Fish and Game. 36pp.
- Jensen, C.C. 1972. *San Joaquin Kit Fox Distribution*. Bureau of Sport Fish and Wildlife, Div. Wildlife Serv., Sacramento, Ca. 22 pp.
- Knapp, D.K. 1978. *Effects of Agricultural Development in Kern County, California, on the San Joaquin Kit Fox in 1977*. Final Report, Project E-1-1, Job V-1.21, Non-Game Wildlife Investigations, California Department of Fish and Game, Sacramento, California.
- Koopman, M.E., B.L. Cypher, and J.H. Scrivner. 2000. Dispersal Patterns of San Joaquin Kit Foxes (*Vulpes macrotis mutica*). *Journal of Mammalogy* 81(1):213–222.
- Laughrin, L. 1970. *San Joaquin Kit Fox, Its Distribution and Abundance*. California Dept. of Fish and Game, Wildlife Management Branch. Administrative Report 70-2, Sacramento. 20pp.
- McGrew, J.C. 1979. *Vulpes macrotis*. *Mammalian Species* 123:1–6.
- Morrell, S.H. 1972. *Life History of the San Joaquin Kit Fox*. California Fish and Game. 58:162–174.
- Morrell, S. 1975. *San Joaquin Kit Fox Distribution and Abundance in 1975*. Administrative Report 75-3, California Department of Fish and Game, Sacramento California. 28 pp.
- NatureServe. 2005. *NatureServe Explorer: An Online Encyclopedia of Life [web application]*. Version 4.6. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: February 24, 2006.
- O'Farrell, T.P., T. Kato, P. McCue, and M.S. Sauls. 1980. *Inventory of the San Joaquin Kit Fox on BLM Lands in Southern and Southwestern San Joaquin*

- Valley. Final Report, ECC 1183-2400, EG&C, Santa Barbara Operations, U.S. Department of Energy, Goleta, California.
- O'Farrell, T.P. and L. Gilbertson 1979. *Ecological Life History of the Desert Kit Fox in the Mojave Desert of Southern California*. Final Report. U.S. Bureau of Land Management, Desert Plan Staff, Riverside, California.
- Orloff, S., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. *Trans. West. Sect. Wildl. Soc.* 22: 60–70.
- Ralls, K., and P.J. White. 1995. Predation on San Joaquin Kit Foxes by Larger Canids. *Journal of Mammalogy* 76:723–729.
- Roderick, P.J. and N.E. Mathews. 1999. Characteristics of Natal and Non-Natal Kit Fox Dens in the Northern Chihuahuan Desert. *Great Basin Naturalist* 59(3):252–258.
- Schwarz, M.K., H.Ralls, D.F. Williams, B.L. Cypher, K.L. Pilgrim, R.C. Fleischer. 2005. *Conservation Genetics*. 6:25–37.
- Scrivner, J.H., T.P. O'Farrell, and T.T. Kato. 1987. *Dispersal of San Joaquin Kit Foxes, Vulpes macrotis mutica, on Naval Petroleum Reserve #1, Kern County, California*. Rep. No. EGG 10282-2190, EG&G Energy Measurements, Goleta, Ca. 32 pp.
- Spiegel, L.K. and M. Bradbury. 1992. Home Range Characteristics of the San Joaquin Kit Fox in Western Kern County, California. *Transactions of the Western Section Wildlife Society* 28:83–92.
- Sproul, M.J. and M.A. Flett. 1993. Status of the San Joaquin Kit Fox in the Northwest Margin of its Range. *Transactions of the Western Section of the Wildlife Society* 29:61–69.
- Swick, C.D. 1973. *Determination of San Joaquin Kit Fox in Contra Costa, Alameda, San Joaquin, and Tulare Counties*. Special Wildlife Investigations Program Report W-54-R4, California Department of Fish and Game, Sacramento, California. 14 pp.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Upland Species of the San Joaquin Valley, California*. U.S. Fish and Wildlife Service. Region 1, Portland, OR. 319 pp.
- U.S. Fish and Wildlife Service. 2006. Biological Opinion for Proposed State Route 152 Safety Operational Improvements Project in Santa Clara County, CA (Caltrans EA 174931). April 26. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Sacramento, CA.

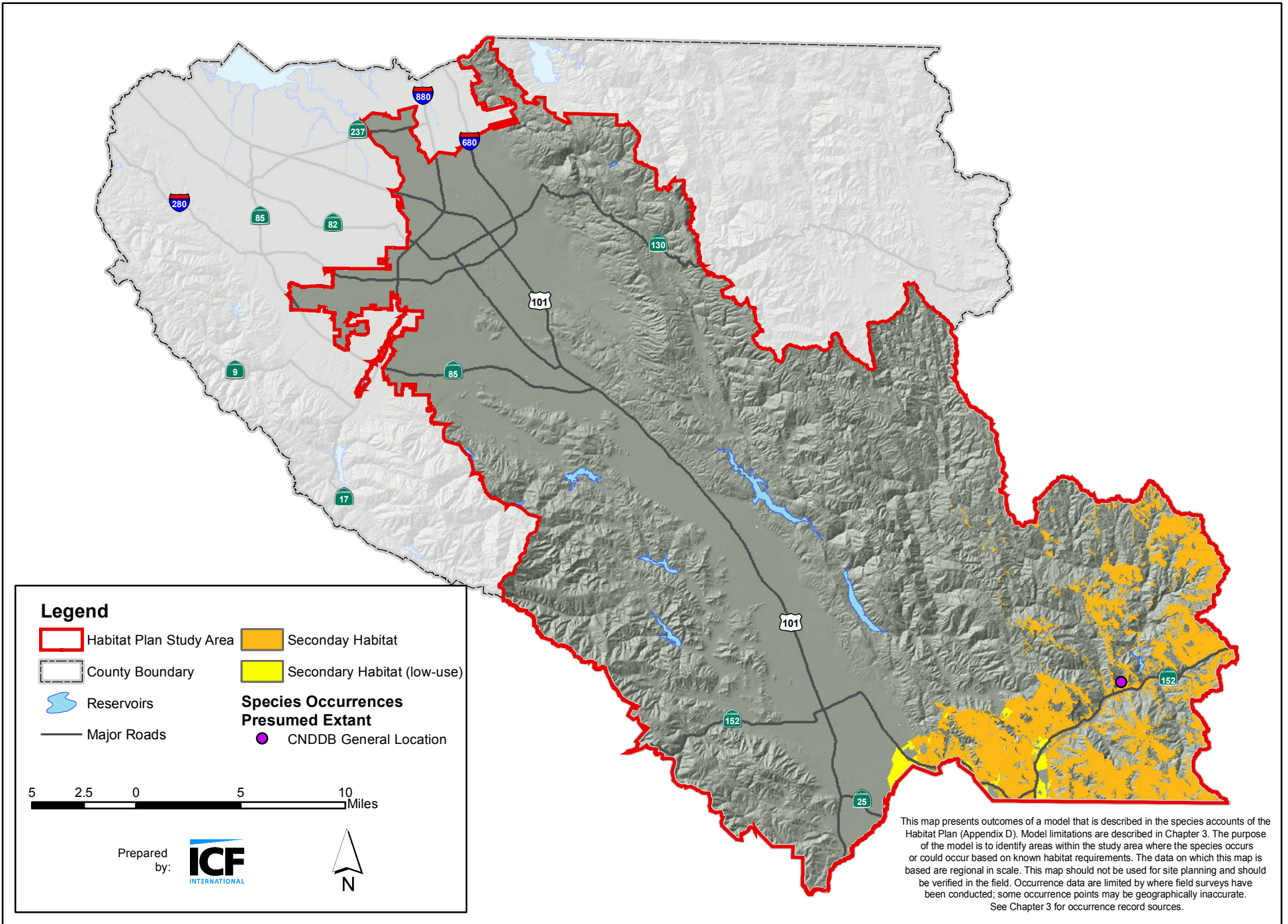
- U.S. Fish and Wildlife Service. 2010. *San Joaquin Kit Fox (Vulpes macrotis mutica) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service. Sacramento Fish and Wildlife Office, Sacramento, CA. 121pp.
- White, P.J. and K. Ralls. 1993. Reproduction and Spacing Patterns of Kit Foxes Relative to Changing Prey Availability. *Journal of Wildlife Management*. 57(4):861–867.
- White, P.J., W.H. Berry, J.J. Eliason, and M.T. Hanson. 2000. Catastrophic Decrease in an Isolated Population of Kit Foxes. *Southwestern Naturalist* 45(2) pp. 204–211.
- Zoellick, B.W., R.P. O’Farrell, P.M. McCue, C.E. Harris, and T.K. Kato. 1987. *Reproduction of the San Joaquin Kit Fox on Naval Petroleum Reserve #1, Elk Hills, California, 1980–1985*. U.S. Dept. of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. EGG 10182–2144. 42 pp.





**Figure 1**  
**San Joaquin Kit Fox (*Vulpes macrotus mutica*)**  
**Distribution in California**





**Figure 2**  
**San Joaquin Kit Fox Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

# Tiburon Indian Paintbrush (*Castilleja affinis* ssp. *neglecta*)

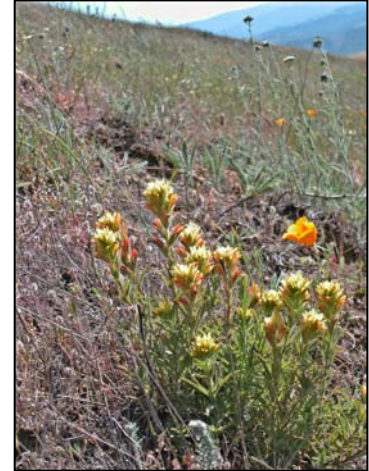
## Legal Status

**State:** Threatened (California Department of Fish and Game 1990); California Native Plant Society 1B.<sup>1</sup>

**Federal:** Endangered (U.S. Fish and Wildlife Service 1995)

**Critical Habitat:** None

**Recovery Planning:** *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)



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## Taxonomy

Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*) was first collected in 1925 by Katherine Brandegee and described as *Castilleja neglecta* by Zeile at that time (Jepson 1925). In the updated Jepson Manual (Hickman 1993), the species was reduced to subspecific status by Chuang and Heckard.

## Description

Tiburon Indian paintbrush is an herbaceous perennial traditionally placed in the figwort family (Scrophulariaceae). Paintbrush species are hemiparasites, obtaining a portion of their nutrients by parasitizing other plant species. Recent studies suggest that the genus *Castilleja* should be grouped with other parasitic and hemiparasitic plants in the Broomrape Family (Orobanchaceae) (Olmstead et al. 2001). The host plant for Tiburon Indian paintbrush is unknown.

## Distribution

### General

Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*) is known from nine occurrences in Marin, Napa, and Santa Clara Counties (California Natural Diversity Database 2007, Stuart Weiss pers. comm.) (Figure 1). The range of the plant is approximately 30 miles (east-west) by 70 miles (north-south) (U.S. Fish and Wildlife Service 1995).

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; 0.1 means seriously endangered in California

## Occurrences within the Study Area

### Historical

Both occurrences of Tiburon Indian paintbrush in the study area are presumed to be extant (California Natural Diversity Database 2007).

### Extant

The two populations of the species in Santa Clara County (occurrence #7 and #9) are found along Coyote Ridge north of Morgan Hill. One occurs on land owned by Santa Clara County Waste Management, and one occurs on land owned by Castle and Cook and leased by Santa Clara County Waste Management. These populations occur on 1/3 of a hectare of land within the Kirby Canyon area. The southern population (occurrence #7) is located on the top of Paintbrush Hill and on its northeast-facing slope. The northern population is located in North Canyon on a steep north-facing slope (occurrence #7 and #9) (Stuart Weiss pers. comm.). These two populations were recently recounted in 2006. It should be noted that occurrence #7 in the California Natural Diversity Database represents both the Paintbrush Hill and North Canyon populations, while occurrence #9 refers to the North Canyon population alone (Stuart Weiss pers. comm.; California Natural Diversity Database 2007). This latter population is by far the largest occurrence in all three counties in which the species is found.

## Natural History

### Habitat Requirements

Tiburon Indian paintbrush is a strict serpentine endemic species found in rocky serpentine bunchgrass communities between 250 and 1,300 ft in elevation (Safford et al. 2005; California Natural Diversity Database 2007).

Associated native plants can include California gilia (*Gilia achilleifolia* ssp. *multicaulis*), California melic (*Melica californica*), California poppy (*Eschscholzia californica*), dwarf plantain (*Plantago erecta*), foothill needlegrass (*Stipa* [*Nassella*] *lepida*), hayfield tarweed (*Hemizonia congesta* ssp. *congesta*), longhorn plectritis (*Plectritis macrocera*), purple needlegrass (*Stipa* [*Nassella*] *pulchra*), purple sanicle (*Sanicula bipinnatifida*), royal larkspur (*Delphinium variegatum* ssp. *variegatum*), and slender fairyfan (*Clarkia gracilis* ssp. *gracilis*). Rare species often found in occurrence with Tiburon Indian paintbrush include Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*), Marin dwarf-flax (*Hesperolinon congestum*), serpentine reedgrass (*Calamagrostis ophitidis*), Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*), Tiburon jewelflower (*Streptanthus glandulosus* ssp. *niger*), fragrant fritillary (*Fritillaria liliacea*), and Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*) (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2007). Non-native plants frequently found in association with Tiburon Indian paintbrush include Italian

ryegrass (*Festuca perennis* [*Lolium multiflorum*]), slender wild oat (*Avena barbata*), and soft brome (*Bromus hordeaceus*) (U.S. Fish and Wildlife Service 1998).

**Table 1.** Habitat Associations for Tiburon Indian Paintbrush

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Serpentine bunchgrass grassland	N/A	Serpentinite soils, often rocky sites with low coverage of non-native species, on north- to west-facing slopes, 250–1,300 feet	Unknown	U.S. Fish and Wildlife Service 1995; California Natural Diversity Database 2007

## Population Ecology

The yellow flowers of Tiburon Indian paintbrush are hummingbird pollinated (Kevin Bryant pers. comm.). Seed dispersal occurs from June to October. The plant dies back to its woody base after seed dispersal and new growth occurs after the first winter rain. Seeds remain dormant in the soil until appropriate conditions occur, which can take several years (Martin 1989; U.S. Fish and Wildlife Service 1998). Germination may be induced by water (disintegrates the netted seed coat) and low temperatures (5 to 15 degrees Celsius or 45–59 degrees Fahrenheit) (Kevin Bryant pers. comm.; U.S. Fish and Wildlife Service 1998). Seedling establishment may be negatively affected by slow root growth, although the establishment and success of this plant is likely the result of several factors such as local climate, soils, and the amount of herbivory (Martin 1989; U.S. Fish and Wildlife Service 1998).

The size of the eight recorded populations are small (some under 100 individuals), with the largest population consisting of approximately 1,000 individuals at the North Canyon site in the Kirby Canyon area of Coyote Ridge in Santa Clara County (California Natural Diversity Database 2007; Stuart Weiss pers. comm.). The Kirby Canyon Butterfly Trust is now actively monitoring the populations in the Kirby Canyon area in order to obtain additional demographic and ecological information about the species (Stuart Weiss pers. comm.). Table 2 shows key life cycle periods for the Tiburon Indian paintbrush.

**Table 2.** Key Seasonal Periods for Tiburon Indian paintbrush (Kevin Bryant pers. comm.)

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓									✓	✓
Flowering				✓	✓	✓	✓					
Fruiting				✓	✓	✓	✓					
Seed Dispersal						✓	✓	✓	✓	✓		

## Population Status and Trends

**Global:** Stable

**State:** Stable

**Within Study Area:** Stable but need further study

All eight occurrences of Tiburon Indian paintbrush are presumed to be extant (California Natural Diversity Database 2007). Additional monitoring needs to be carried out to determine the true status of the populations both within and outside of the study area. In Marin, the Ring Mountain population (occurrence #4) was last checked in 2006 and appears to be in a steady-state condition, while the St. Hilary's population (occurrence #2) is very small and may be in decline (D. Herlocker pers. comm.).

## Threats

Population trends are uncertain, although they are likely to be stable, as the habitat in which they occur is rated fair to excellent (California Natural Diversity Database 2007). Potential threats include habitat loss through encroachment of residential development, proposed quarry expansion, herbivory by deer, trampling by dogs, foot traffic, soil slumping, competition from invasive exotic species, and disturbance from feral pig rooting (U.S. Fish and Wildlife Service 1995; California Natural Diversity Database 2007). The latter threat is especially a problem at the Paintbrush Hill site in Santa Clara County. Grazing is also listed as a threat, but may actually be beneficial in certain areas (Stuart Weiss pers. comm.).

## Data Characterization

Of the eight occurrences listed in the California Natural Diversity Database for Tiburon Indian paintbrush, five of these have been documented in the previous 10 years, and all have been documented within the last 19 years. All of these occurrences are believed to be extant; most are of high precision and may be accurately located.

There is still much to learn regarding the population ecology and demographics of Tiburon Indian paintbrush. The main sources of general information on the Tiburon Indian paintbrush are *The Jepson Manual* (Chuang and Heckard 1993), a master's thesis (Martin 1989), and the California Native Plant Society (2001). Specific observations on habitat and plant associates, threats, and other factors are found in the California Natural Diversity Database (2007) and in the Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (U.S. Fish and Wildlife Service 1998). Additional information can be found in the Final Rule listing the species as endangered (60 Federal Register 6671–6685, February 3, 1995).

## Existing Conservation Actions in the Study Area

In Santa Clara County, the northern population (North Canyon) of Tiburon Indian paintbrush is on privately owned land which Santa Clara County Waste Management may look to acquire and protect as a mitigation site for the Kirby Canyon Landfill. The southern population (Paintbrush Hill) is currently functioning as a mitigation site for the Landfill and is located on a reserve for bay checkerspot butterfly conservation (U.S. Fish and Wildlife Service 1998). Both populations are being monitored and managed by the Kirby Canyon Butterfly Trust, which plans to begin collecting seed from these populations in the near future. They are working on a way to reduce damage caused by feral pig rooting in the southern site while still maintaining cattle grazing, which appears to keep invasive non-native species in check (Stuart Weiss pers. comm.).

## Modeled Habitat Distribution in Study Area

A model was not developed for Tiburon Indian paintbrush because the serpentinite soils at the two Santa Clara occurrences appear to be unique and quite different than other serpentinite soils in the area.

## Literature Cited

### Printed References

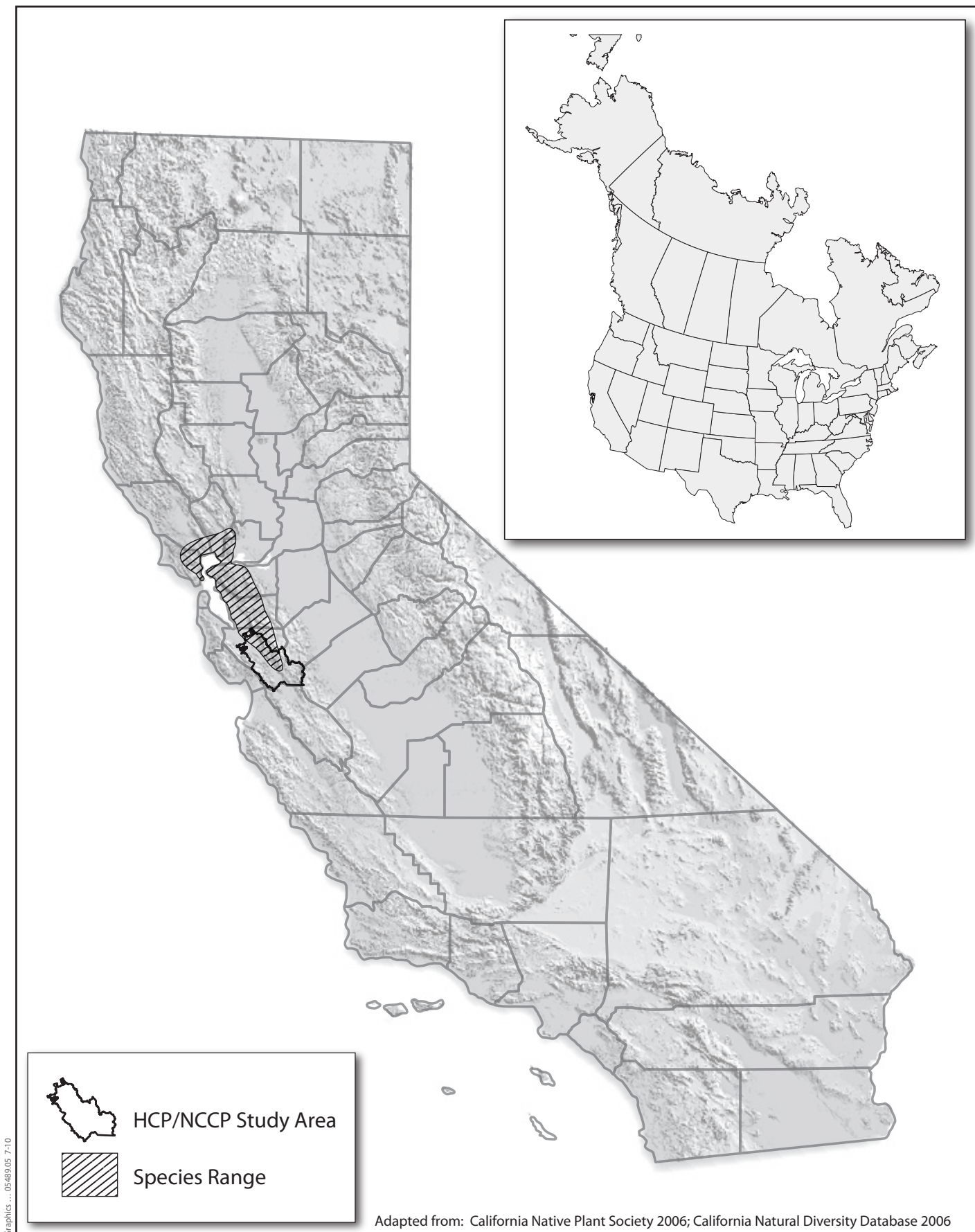
- Calflora. 2007. Information on California plants for education, research and conservation [web application]. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <<http://www.calflora.org/>>. Accessed: April 11, 2007.
- California Native Plant Society. 2007. *Inventory of Rare and Endangered Plants* (online edition, v7-06a). California Native Plant Society. Sacramento, CA. Available: <<http://www.cnps.org/inventory>>. Accessed: April 11, 2007.
- California Native Plant Society. 2001. *Inventory of Rare and Endangered Plants of California (sixth edition)*. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society, Sacramento, CA.
- California Natural Diversity Database. 2007. RareFind 3, Version 3.1.0 (February 3, 2007 update). California Department of Fish and Game, Sacramento, CA.

- J. C. Hickman. 1993. *The Jepson manual: higher plants of California*. Berkeley, CA: University of California Press. Chuang, T. I., and L. R. Heckard. *Castilleja*. Pages 1016–1024.
- Jepson, W. 1925. *Manual of the Flowering Plants of California*. Berkeley, CA: University of California Press.
- Martin, K.F. 1989. The characteristics of seed germination and seedling establishment of *Castilleja neglecta*. M.A. thesis, San Francisco State University.
- Olmstead, R.G., C.W. DePamphilis, A.D. Wolfe, N.D. Young, W.J. Elisons, and P.A. Reeves. 2001. Disintegration of the *Scrophulariaceae*. *American Journal of Botany* 88(2): 248–361.
- Safford, H.D., J.H. Viers, and S.P. Harrison. 2005. Serpentine Endemism in the California Flora: A Database of Serpentine Affinity. *Madrono* 52(4):222–257.
- U.S. Fish and Wildlife Service. 1995. *Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Ten Plants and Threatened Status for Two Plants From Serpentine Habitats in the San Francisco Bay Region of California*. Federal Register [pp. 6671–6685, Friday, February 3, 1995]. Portland, Oregon.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.

## Personal Communications

- Bryant, Kevin. President, Santa Clara County Chapter of the California Native Plant Society. April 2007—Phone Call.
- Weiss, Stuart. Biologist, Creekside Center for Earth Observation. April 2007 and July 2008—Phone Calls.
- Herlocker, D. Marin County Open Space District. May 2007—Email.

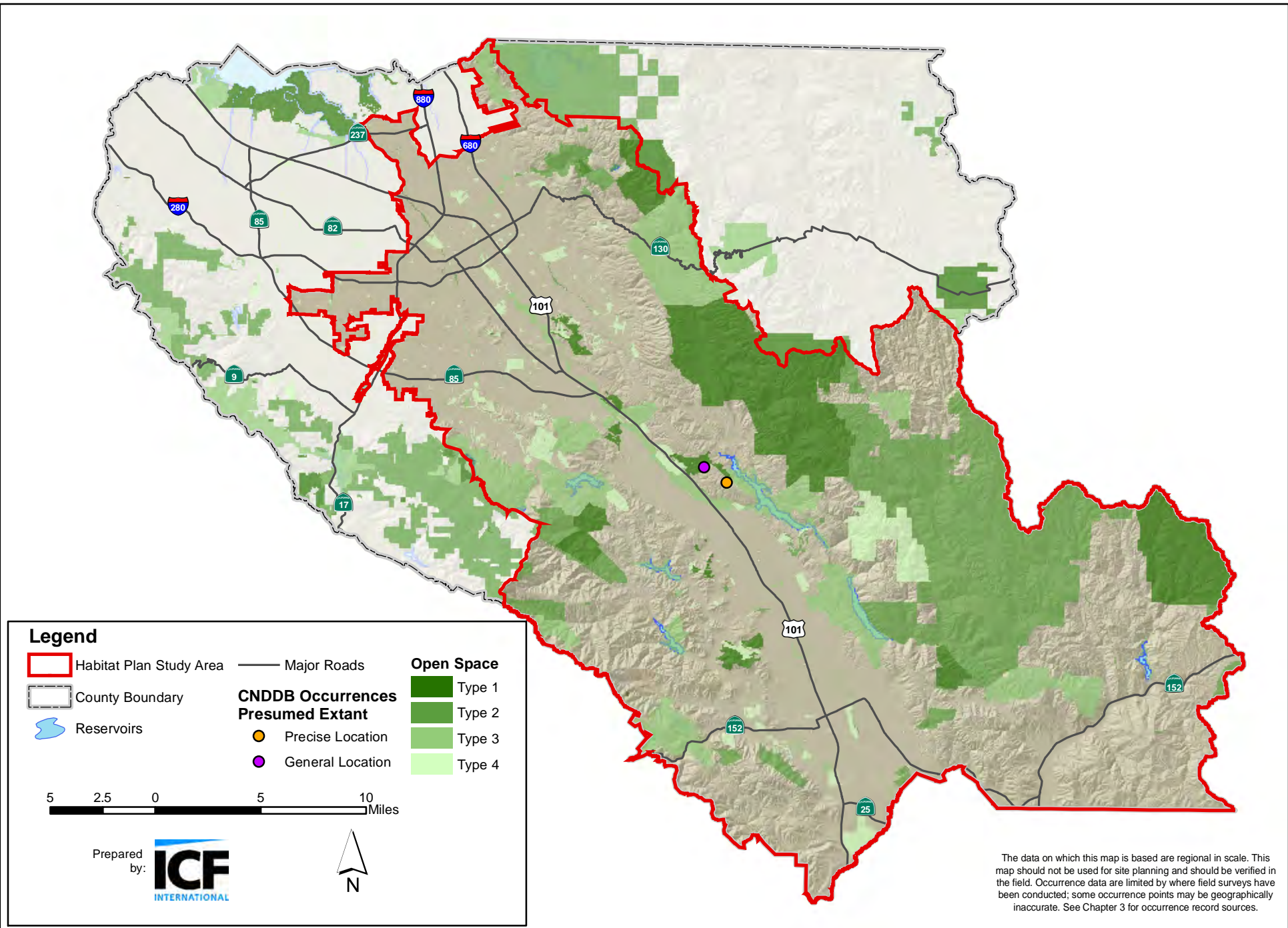




**Figure 1**  
**Tiburon Indian paintbrush (*Castilleja affinis* ssp. *neglecta*)**  
**Distribution in California**



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**Figure 2**  
**Tiburon Indian Paintbrush Occurrence Records - Santa Clara Valley Habitat Plan**

# Coyote Ceanothus (*Ceanothus ferrisiae*)

## Legal Status

**State:** California Native Plant Society 1B.1<sup>1</sup>

**Federal:** Endangered (U.S. Fish and Wildlife Service 1995)

**Critical Habitat:** None

**Recovery Planning:** *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998); *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation*. (U.S. Fish and Wildlife Service 2011)



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## Taxonomy

Coyote ceanothus (*Ceanothus ferrisiae* McMinn) is the accepted name for this species (Integrated Taxonomic Information System 2012). McMinn (1933) originally described the species based on specimens collected above Coyote Creek, along Madrone Springs Road. Coyote ceanothus is a member of the buckthorn family (Rhamnaceae).

## Description

Descriptions of the species' physical characteristics can be found in McMinn (1959), Munz and Keck (1959), Schmidt (1993), Corelli and Chandik (1995), and U.S. Fish and Wildlife Service (1998 and 2011). Coyote ceanothus is an erect evergreen shrub 1–2 m tall, with long spreading primary branches and short lateral branches (McMinn 1959). Its leaves are usually opposite and round, while the leaf margins are short-toothed to entire (Corelli and Chandik 1995). Its white flowers are in clusters and the seed capsules have three apical horns (U.S. Fish and Wildlife Service 1998).

## Distribution

### General

Coyote ceanothus is known from three occurrences in the Mt. Hamilton Range in Santa Clara County (Figure 1; U.S. Fish and Wildlife Service 2011). This species is endemic to California and is only found in Santa Clara County.

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; 0.1 means seriously endangered in California.

## Occurrences within the Study Area

### Historical

There is one reported occurrence in Santa Clara County from Croy Canyon in 1929 (California Natural Diversity Database Occurrence #4). However, field surveys at the same locality in 1985 and 1987 failed to locate any plants (California Natural Diversity Database 2006). According to the U.S. Fish and Wildlife Service and the California Natural Diversity Database, the record may be erroneous (U.S. Fish and Wildlife Service 1998, California Natural Diversity Database 2006).

### Extant

The CNDDDB lists four extant occurrences of Coyote ceanothus, all of which are within 4 miles of each another (U.S. Fish and Wildlife Service 1995; U.S. Fish and Wildlife Service 1998; California Native Plant Society 2006). However, for the purposes of this Plan, the two occurrences in the vicinity of Anderson Dam (CNDDDB Occurrence numbers 6 and 8) are considered one occurrence. The other two occurrences are at Kirby Canyon and near Llagas Avenue north of Morgan Hill (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006). All three occurrences are on private land, except for a small part of the Anderson Dam occurrence, which partially falls within Anderson Lake County Park (California Natural Diversity Database Occurrence #8).

## Natural History

### Habitat Requirements

Coyote ceanothus is generally found growing on dry slopes in chaparral, grassland, and coastal scrub on serpentine soils, from approximately 400–1,500 feet (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006; California Native Plant Society 2006). Species commonly associated with Coyote ceanothus are California sagebrush (*Artemisia californica*), foothill pine (*Pinus sabiniana*), bigberry manzanita (*Arctostaphylos glauca*), toyon (*Heteromeles arbutifolia*), California coffeeberry (*Frangula [Rhamnus] californica*), and leather oak (*Quercus durata*) (U.S. Fish and Wildlife Service 1998). Some occurrences of Coyote ceanothus are almost pure stands of this species (U.S. Fish and Wildlife Service 2011).

**Table 1.** Habitat Associations for Coyote Ceanothus

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Mixed serpentine chaparral	Primary habitat	Dry shallow slopes 400–1,500 feet	High	U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006; California Native Plant Society 2006
Serpentine bunchgrass grassland	Primary habitat	400–1,500 feet	High	Same as above

## Population Ecology

Recent research and observation strongly suggest that periodic fire may be crucial for germination and regeneration of senescent stands of this plant (U.S. Fish and Wildlife Service 2011). The only known observations of seedlings in nature occurred after fires in Kirby Canyon (K. Freas 1996 in U.S. Fish and Wildlife Service 1998) and at Anderson Reservoir (J. Hillman 2006; U.S. Fish and Wildlife Service 2011). The latter population burned in 2003 and significant recruitment was observed in 2004. Many young shrubs of the same size and age class were also observed at that site in 2006. In surveys conducted in the 1980s, there were few young shrubs and no signs of reproduction present in the Anderson Dam populations (Schmidt 1996 in U.S. Fish and Wildlife Service 1998). At least one ceanothus expert feels that Coyote ceanothus may require some frequency of burning in order to maintain healthy populations that include young shrubs.

The lack of seedling recruitment seen in natural populations may also be due to seed or seedling mortality caused by factors such as seed predation, grazing and browsing, lack of sufficient precipitation to maintain young plants through dry summer following germination, or several of these together. Key seasonal periods for the species are listed in Table 2.

**Table 2.** Key Seasonal Periods for Coyote Ceanothus

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓								✓	✓	✓
Flowering	✓	✓	✓	✓	✓							
Fruiting		✓	✓	✓	✓	✓						
Seed Dispersal					✓	✓	✓	✓	✓	✓	✓	

## Population Status and Trends

**Global:** *Declining* (NatureServe 2006)

**State:** *Declining* (NatureServe 2006)

**Within Study Area:** *Declining* (California Native Plant Society 2006; NatureServe 2006)

The four documented occurrences include approximately 189,475 plants in total based on estimates from the Recovery Plan (U.S. Fish and Wildlife Service 1998) and a field survey conducted in 2009 by the SCVWD of the population near Anderson Dam (SCVWD, unpublished data). The largest population by far, approximately 188,475 individuals, is near Anderson Dam. The majority of the plants in the larger of the two subpopulations near the Dam emerged following a fire in 2003 (U.S. Fish and Wildlife Service 2011). The two occurrences located there may have been continuous prior to construction of the Dam (U.S. Fish and Wildlife Service 1998). The smallest population burned during the Kirby Canyon fire in 1992. Although only 5% of the individuals survived, around 2,000 seedlings were seen in the spring of 1993. Approximately 100 seedlings were individually caged to ward off grazers and seemed to be doing well when observed the following year (K. Freas pers. comm. 1996 in U.S. Fish and Wildlife Service 1998). Approximately 150 plants were observed during a survey of the Kirby Canyon population in the fall of 2010 (U.S. Fish and Wildlife Service 2011). Approximately 500 individuals, all of the same age class, were observed in the third population at Llagas Avenue north of Morgan Hill in 1997 (California Department of Fish and Game 1997 in U.S. Fish and Wildlife Service 1998). During surveys in the fall of 2010 around 600 to 650 plants were observed in this same location (U.S. Fish and Wildlife Service 2011).

## Threats

Documented threats to Coyote ceanothus include habitat loss and fragmentation, residential development, illegal trash dumping, recreation, landfill activities, lack of natural recruitment, altered fire regimes, grazing, and genetic isolation and limited insect-mediated gene flow (U.S. Fish and Wildlife Service 1998; 2011). The largest population near Anderson Dam is bisected by an existing gas utility line operated by The Pacific Gas and Electric Company (K. Devitorrio pers. comm.). Routine and emergency maintenance of this underground gas line may impact this key population. This population could also be threatened by Santa Clara Valley Water District work on the reservoir and dam maintenance, including the proposed seismic retrofit of the dam. Trail maintenance by Santa Clara County Parks could also pose a threat to this species.

## Data Characterization

Because Coyote ceanothus is a large and conspicuous shrub, it is thought that most of the occurrences of this species are known. However, it is possible that some individuals and populations have been overlooked because they are

mistaken for more common species of *Ceanothus*, including the closely related buckbrush (*C. cuneatus*). Further, some hybridization between Coyote ceanothus and buckbrush is suspected to occur and some hybrid populations may exist on Pallousou Ridge adjacent to Henry Coe State Park (T. Cochrane pers. comm.) and in other areas.

Recent research, in addition to anecdotal accounts, indicates that interspecific hybridization occurs between species of *Ceanothus* (Hardig et al., 2000; U.S. Fish and Wildlife Service 2011) and it is now widely accepted that hybrid speciation has occurred in the subgenus *Cerastes*, of which Coyote ceanothus is a species (Hardig et al. 2000). Ongoing genetic studies on this plant may provide additional information on the genetic status, genetic diversity, and population structure of Coyote ceanothus (U.S. Fish and Wildlife Service 2011). This research may provide useful information for the restoration and recovery of this species.

A good account of the habitat and occurrences of Coyote ceanothus can be found in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) and in *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation* (U.S. Fish and Wildlife Service 2011). The documented habitat requirements of this species suggest that it should be more widespread than it is, indicating that our knowledge of the species population dynamics are incomplete. The species' habitat requirements may be highly specialized, or other factors are preventing the species' spread into otherwise suitable areas.

## Existing Conservation Actions in the Study Area

Waste Management, Inc. and The Nature Conservancy funded K. Freas's research (mentioned above) on Coyote ceanothus (U.S. Fish and Wildlife Service 1998). In the summer of 1992, the Kirby Canyon population burned. The following spring, 2,000 seedlings were observed and were fenced to protect them from grazing. Additional caging on some plants was added to protect against deer and rabbit grazing (K. Freas pers. comm. 1996 in U.S. Fish and Wildlife Service 1998). The Santa Clara Valley Water District was involved in mitigating for impacts on Coyote ceanothus resulting from the enlargement of the spillway to Anderson Dam (Santa Clara Valley Water District 1993 in U.S. Fish and Wildlife Service 1998). Two shrubs were successfully transplanted in 1997 (C. Roessler pers. comm. 1996 in U.S. Fish and Wildlife Service 1998), however they did not survive (R. Austin 2006). Waste Management, Inc. and Santa Clara Valley Water District have done some revegetation work with Coyote ceanothus that has not impacted the status of the species (K. Freas pers. comm. 1996 and D. Amshoff pers. comm. 1997 in U.S. Fish and Wildlife Service 1998). There are no on-going conservation efforts for Coyote ceanothus known to occur in the study area. A Santa Clara Valley Water District spillway modification project in 1992 planted approximately 175 seedlings; their current status is not known.

**Table 4.** Conservation Actions in the Study Area for Coyote Ceanothus

Action	Timing	Lead Agency	Location
Population ecology research	Implemented	Waste Management, Inc. and Nature Conservancy	Kirby Canyon population
Revegetation experimentation	Implemented	Waste Management, Inc. and Santa Clara Valley Water District	Anderson Dam population
Translocation	Implemented, Unsuccessful	Santa Clara Valley Water District	Anderson Dam population
Seedling outplanting	Implemented	Santa Clara Valley Water District	Need to find out from J. Hillman

## Modeled Habitat Distribution in Study Area

A habitat distribution model was not developed for this species because of the extremely limited range of the species and the uncertainty in its localized habitat requirements. A habitat model based on known habitat requirements that have been mapped at a regional scale (i.e., land cover types for this HCP/NCCP) would result in a model that greatly overestimates available habitat.

## Literature Cited

### Printed References

- Calflora: Information on California plants for education, research and conservation. [web application]. 2006. Berkeley, California: The Calflora Database. Available: <<http://www.calflora.org/>>. Accessed: March 3, 2006.
- California Native Plant Society. 2006. Inventory of Rare and Endangered Plants (online edition, v7-06a). California Native Plant Society. Sacramento, CA. Available: <<http://www.cnps.org/inventory>>. Accessed: March 3, 2006.
- California Natural Diversity Database. 2006. *Occurrence Report for Ceanothus ferrisiae*. RareFind Version 3.0.5 (Updated March 31, 2006). Sacramento, CA: California Department of Fish and Game.
- Corelli, T. 1991. A petition to the State of California Fish and Game Commission to list Coyote ceanothus (*Ceanothus ferrisiae*).
- Corelli, T. and Chandik, Z. 1995. *The Rare and Endangered Plants of San Mateo and Santa Clara County*. Monocot Press, Half Moon Bay, CA.
- Hardig, T.M., P.S. Soltis, and D.E. Soltis. 2000. Diversification of the North American shrub genus *Ceanothus* (Rhamnaceae): conflicting phylogenies

from nuclear ribosomal DNA and chloroplast DNA. *American Journal of Botany* 87:108–123.

Integrated Taxonomic Information System. 2012. ITIS online database.

Available: <<http://www.itis.gov>>. Retrieved March 8, 2012.

McMinn, H.E. 1933. Two new species of *Ceanothus* from California. *Madroño* 2:89–90.

McMinn, H.E. 1959. An illustrated manual of California shrubs, third printing. Berkeley, CA: University of California Press.

Munz, P.A., and Keck, D.D. 1959. *A California Flora*. Berkeley, CA: University of California Press.

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.6. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: Thursday March 3, 2006.

Schmidt, C.L. 1996. Letter to Diane Elam, U.S. Fish and Wildlife Service, Sacramento, CA.

Schmidt, C.L. 1993. *Ceanothus*. Pages 932–939 in J.C. Hickman (ed.), *The Jepson manual: higher plants of California*. Berkeley, CA: University of California Press.

U.S. Fish and Wildlife Service. 1995. *Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Ten Plants and Threatened Status for Two Plants From Serpentine Habitats in the San Francisco Bay Region of California*. Federal Register [pp. 6671–6685, Friday, February 3, 1995] Portland, Oregon.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.

U.S. Fish and Wildlife Service. 2011. *Ceanothus ferrisiae* (Coyote ceanothus) 5-Year Review: Summary and Evaluation. Sacramento, CA.

## Personal Communications

Amshoff, Deborah. 1997. Santa Clara Valley Water District, San José, CA (in U.S. Fish and Wildlife Service 1998).

Austin, Rick. 2006. Santa Clara Valley Water District, San José, CA. 2006. personal communication to Janell Hillman.

Cochrane, Tom. 2007. February 6, 2007. Email to Janell Hillman.



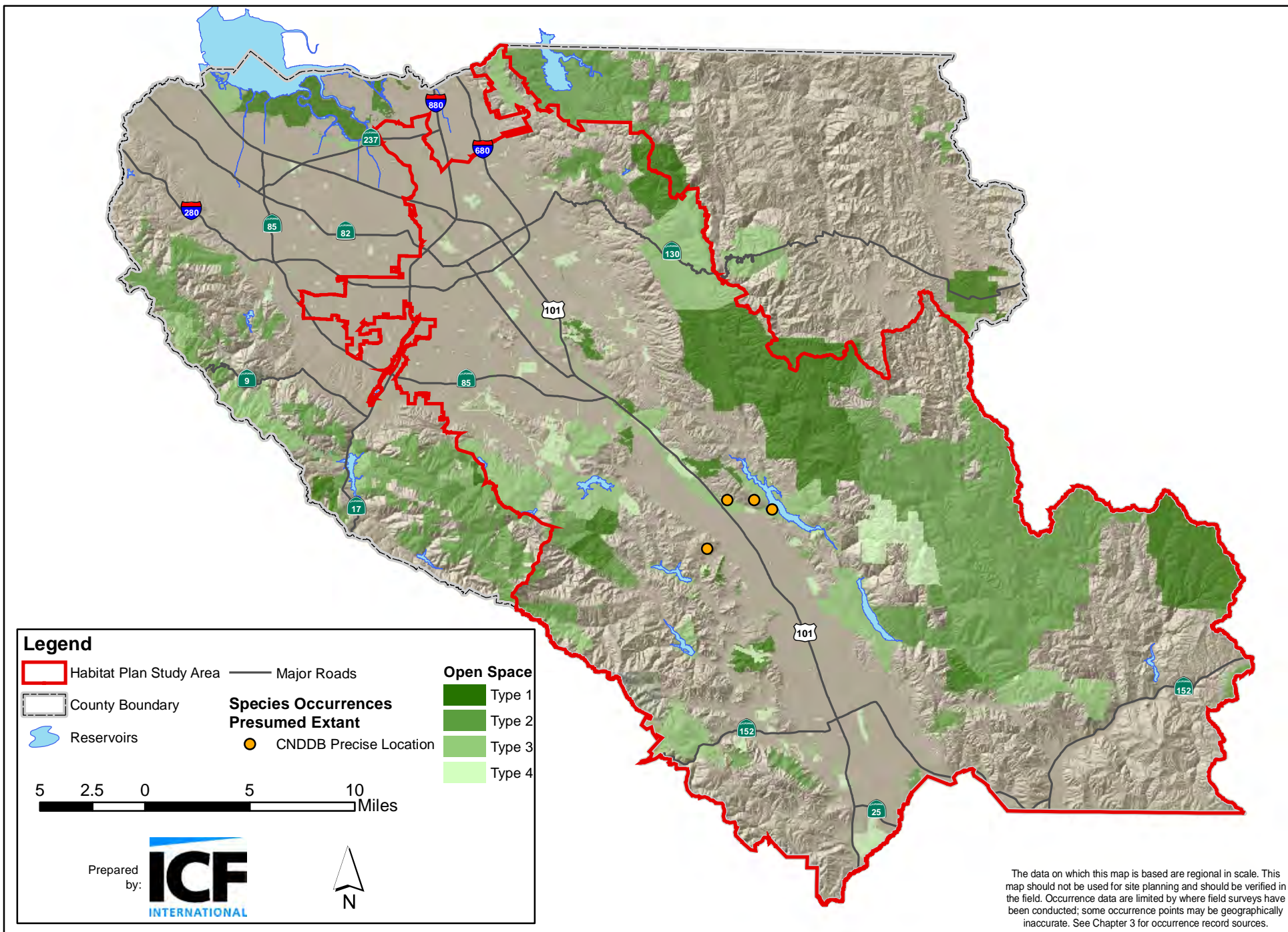
Devittorio, Ken. 2006. Senior Biologist, Technical and Ecological Services, Pacific Gas & Electric Company. San Ramon, CA. Meeting with David Zippin, February.

Freas, Kathry. 1996. CH2M Hill, San José, CA (in U.S. Fish and Wildlife Service 1998).

Hillman, Janell. 2006. Botanist, Santa Clara Valley Water District, San José, CA. Comments on Draft Species Account.

Roessler, Cindy. 1996. Santa Clara Valley Water District, San José, CA (in U.S. Fish and Wildlife Service 1998).





**Figure 2**  
Coyote Ceanothus Occurrence Records - Santa Clara Valley Habitat Plan



## Mount Hamilton Thistle (*Cirsium fontinale* var. *campylon*)



### Legal Status

**State:** California Native Plant Society List 1B.2<sup>1</sup>

**Federal:** None

**Critical Habitat:** N/A

**Recovery Planning:** *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

### Taxonomy

Mount Hamilton thistle was originally described by Helen Sharsmith, based on collections from Del Puerto Canyon in the Mount Hamilton Range of western Stanislaus County (Sharsmith 1939). Sharsmith (1939: 89–90) discussed the close morphological and ecological similarities between this species and the two varieties of *Cirsium fontinale*. These similarities later led to the recognition of Mount Hamilton thistle as a variety of *Cirsium fontinale* (Keil and Turner 1992: 313). Mt. Hamilton thistle is within the aster family (Asteraceae).

### Description

Descriptions of the species' physical characteristics can be found in Sharsmith (1939: 85–86, Figure 1), Munz (1959: 1,276), Abrams and Ferris (1960: 538, Fig. 5934), and Keil and Turner (1993: 236). Mt. Hamilton thistle is a large herbaceous perennial thistle up to 2 to 6.5 feet tall with a single stem. The plant has woolly, spine-tipped leaves that are up to approximately 2 feet long at the base. The large flower heads have recurved bracts and often droop substantially.

### Distribution

#### General

Mount Hamilton thistle is endemic to the San Francisco Bay Area and occurs in Santa Clara, Stanislaus, and Alameda Counties. There are two clusters of populations, one in the Mount Hamilton Ranges, the other in the Santa Cruz Mountains (Figure 1). There are a total of 48 occurrences of Mount Hamilton thistle are known within its range, 40 of which occur within the study area.

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .2 means fairly endangered in California.

Thirty-one of the occurrences within the study area are listed with the California Natural Diversity Database (CNDDDB) (2010). The remaining nine occurrences are not listed with the CNDDDB and are detailed below.

## Occurrences within the Study Area

### Extant

Forty occurrences of Mount Hamilton thistle are known to occur in the study area, all of which have been documented within the last 20 years. Occurrences in the study area are generally found in two areas (Figure 2): In the Santa Teresa Hills and East of Highway 101 in the low hills and canyons along Coyote Ridge and the Silver Creek Hills. Thirty-one occurrences were reported in the CNDDDB (2010). In addition,, two occurrences were reported on the United Technologies Corporation property (T. Marker pers. comm.), four occurrences were found on Santa Clara County Park lands, two occurrences were found on Rancho San Vicente, and one occurrence was recently reported by SCVWD on or near their facilities. Occurrences in northeastern Santa Clara County are outside the study area.

## Natural History

### Habitat Requirements

Mount Hamilton thistle occurs on serpentine soils in seeps and springs and along intermittent and perennial streams. The surrounding habitat is often serpentine bunchgrass grassland, although sometimes the occurrences are within foothill pine woodland or coast live oak forest and woodland (Table 1). The occurrences range in elevation from 320 feet to 2,900 feet.

Species primarily associated with Mount Hamilton thistle include seep monkeyflower (*Mimulus guttatus*) and hedge-nettle (*Stachys pycnantha*), as well as sedge species (*Carex* spp.), iris-leaved rush (*Juncus xiphioides*), and hoary coffeeberry (*Frangula* [*Rhamnus*] *californica* ssp. *tomentella*). Additional associates include Brewer's willow (*Salix breweri*), California poppy (*Eschscholzia californica*), columbine (*Aquilegia eximia*), common yarrow (*Achillea millefolium*), long-rayed triteleia (*Triteleia peduncularis*), and beardless wild rye (*Leymus* [*Elymus*] *triticoides*) (Pilz 1967; U.S. Fish and Wildlife Service 1998).

**Table 1.** Habitat Associations for Mount Hamilton Thistle

Land Cover Type	Habitat Designation	Habitat Parameters	Rationale
Serpentine bunchgrass grassland	Primary habitat (in suitable aquatic habitat)	In seeps and springs and along intermittent and perennial streams, 320–2,900 feet elevation.	California Natural Diversity Database 2010
Serpentine seep	Primary habitat	In seeps and springs and along intermittent and perennial streams, 320–2,900 feet elevation.	
Foothill pine—oak woodland <sup>1</sup>	Primary habitat (in suitable aquatic habitat)	In seeps and springs and along intermittent and perennial streams, 320–2,900 feet elevation.	California Natural Diversity Database 2010
Coast live oak forest and woodland <sup>1</sup>	Primary habitat (in suitable aquatic habitat)	In seeps and springs and along intermittent and perennial streams, 320–2,900 feet elevation.	California Natural Diversity Database 2010

<sup>1</sup> The species occurs in serpentine seeps within this woodland type, but does not occur in terrestrial habitat of this woodland type.

## Population Ecology

Mount Hamilton thistle generally occurs in small stands of a few plants to several thousand plants, although some larger stands are known (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2010). One location in Santa Clara County in 1992 supported over 18,000 plants (California Natural Diversity Database 2010). The reproductive biology and demography of this species are unknown.

The highly restricted habitat requirements of this species likely greatly limits the species' distribution and abundance. Research indicates that native insects play an important role in the population biology of another endangered *Cirsium* species. Experimental treatments to exclude or reduce moth larvae, weevil larvae, aphids, spittle bugs, and mealybugs from juvenile rosettes of the endangered Pitcher's thistle (*Cirsium pitcheri*) in rare dune habitat of Michigan resulted in substantial increases in plant survival, growth, and seed production where these insects were common (Bevill et al. 1999). These results also suggest that native insects can influence the spatial distribution of native plants. The susceptibility of Mount Hamilton thistle to native or exotic insect herbivory is unknown.

**Table 2.** Key Seasonal Periods for Mount Hamilton Thistle

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓	✓	✓						✓	✓	✓
Flowering		(✓)	(✓)	✓	✓	✓	✓	✓	✓	(✓)		
Fruiting			✓	✓	✓	✓	✓	✓	✓	✓	✓	
Seed Dispersal			✓	✓	✓	✓	✓	✓	✓	✓	✓	

Notes: (✓) Indicates flowering period during certain years.

## Population Status and Trends

**Global:** Unknown, but may be stable

**State:** Same

**Within Study Area:** Same

All occurrences of Mount Hamilton thistle are presumed to be extant (California Natural Diversity Database 2010). Populations of this species are conspicuous and have not shown any obvious signs of population decline or range contraction (Weiss pers. comm.).

## Threats

Reported threats to populations of Mount Hamilton thistle in the study area include alteration of hydrologic regimes, urbanization and cattle grazing (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2010). Urbanization potential is very limited within the range of the species due to its occurrence in deep canyons outside areas designated for urban development. The effects of livestock grazing on this species are unknown. The spiny leaves likely limit grazing of plant tissue but Mount Hamilton thistle may be susceptible to trampling by cattle due to their occurrence in and near livestock water sources. Road construction or future landfills may pose a threat. Expansion of the Kirby Canyon Landfill is expected to remove at least one population or portion of a population of Mount Hamilton thistle.

The introduction of aggressive insect herbivores is a common technique to control invasive weedy thistles. Native thistles have been shown to be negatively affected by these biological control agents. For example, Louda and O'Brien (2002) demonstrated that the Eurasian weevil (*Larinus planus*), which is distributed in North America for the control of Canada thistle (*Cirsium arvense*), had spread to native populations of Tracy's thistle (*Cirsium undulatum* var. *tracyi*) in Colorado. Canada thistle is found throughout most of California, including Santa Clara County (Bossard et al. 2000).

A European flower-head weevil *Rhinocyllus conicus* introduced to control exotic thistles was found to destroy flower heads of many native thistles, including *C.*

*fontinale* (Turner et al. 1987; Turner and Herr 1996). Another study found *R. conicus* feeding on other native thistles in southern California (Goeden and Ricker 1986). A study in 2005 found *R. conicus* in the seed heads of *C. fontinale* var. *campylon* (J. Hillman 2006) however work done by Herr (2000) found no evidence of biologically significant impact of the weevil on native Californian *Cirsiums*, including *C. fontinale* var. *campylon*. This flower-head weevil is approved by the U.S. Department of Agriculture for control of exotic thistles common in the study area including bull thistle (*Cirsium vulgare*), milk thistle (*Silybum marianum*), and Italian thistle (*Carduus pycnocephalus*). However, studies have not shown this biocontrol agent to be particularly effective at controlling these invasive plants (Bossard et al. 2000). Its effects on *C. fontinale* var. *campylon* are unknown but the research cited above suggests that biological control of invasive weeds may be a threat to this rare native taxa.

## Data Characterization

Available information is likely to adequately characterize the species' habitat requirements. However, very little data is available on the species' population biology, and no data is available on the management needs of the species. More information is also needed on threats to this species in the study area.

## Existing Conservation Actions in the Study Area

No conservation actions in the study area have directly targeted Mount Hamilton thistle. Protection of some habitat along Coyote Ridge to provide mitigation for impacts to Bay checkerspot butterfly and serpentine grassland, along with improved livestock management in this area have indirectly benefited Mount Hamilton thistle.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

Primary habitat within the study area is defined as serpentine seeps or serpentine soils or grasslands within 25 feet of riverine habitat. This species is only found within the Guadalupe and Coyote watersheds.



## Rationale

Mount Hamilton thistle occurs on areas with serpentine characteristics. This can be any combination of serpentine soils, seeps or springs, typically along streams. The surrounding habitat is often serpentine bunchgrass grassland. The occurrences range in elevation from 320 feet to 2,900 feet.

## Model Results

Figure 2 shows the modeled potential habitat for the Mt. Hamilton thistle within the study area. The potential habitat is confined to known serpentine areas, mostly along Coyote Ridge and in the Santa Teresa Hills. Most of the known occurrences fall within the modeled habitat. Some occurrences may fall outside modeled habitat due to the mapping limitations of springs of serpentine origin.

## Literature Cited

### Printed References

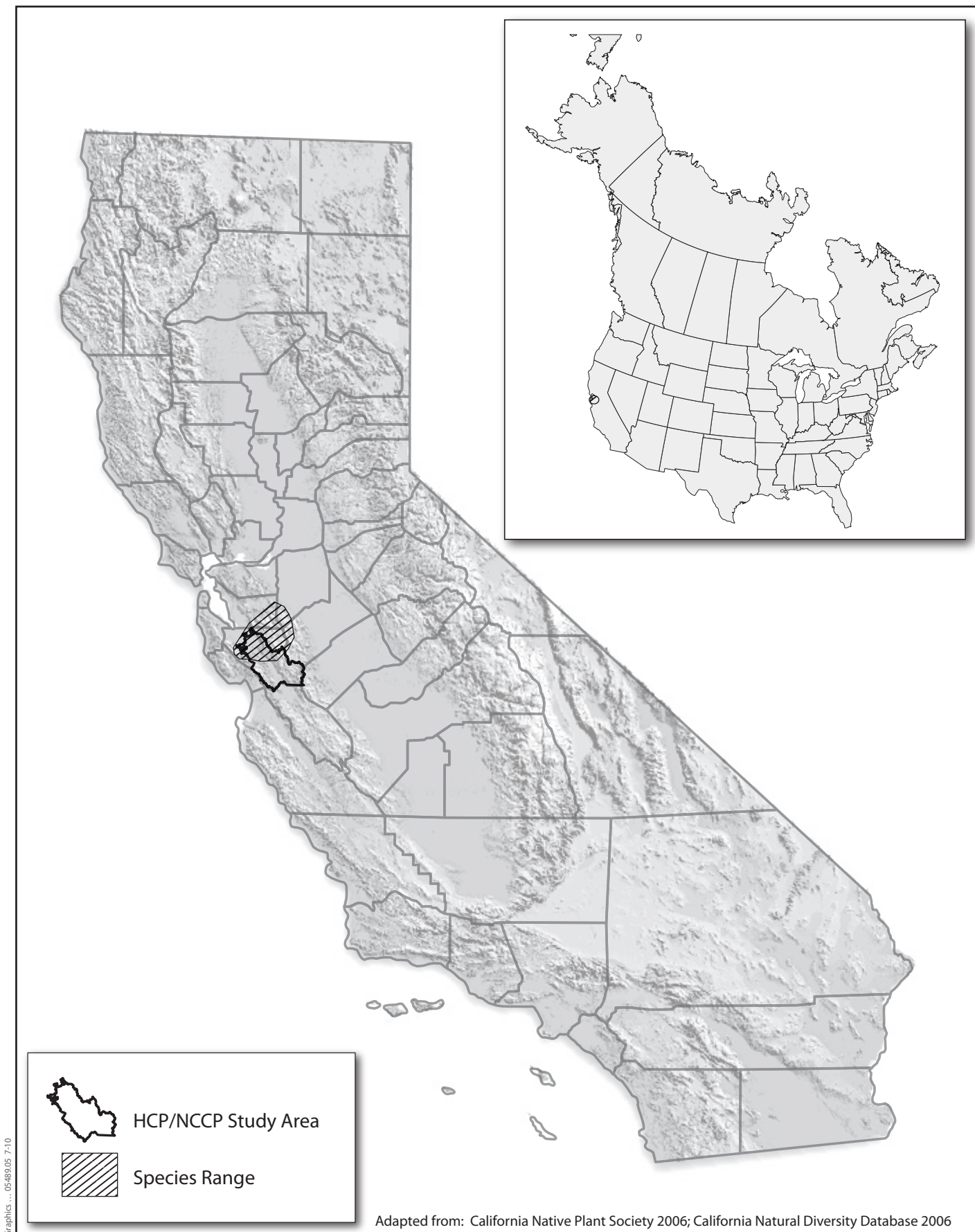
- Abrams, L., and R.M. Ferris. 1960. *Illustrated Flora of the Pacific States, Washington, Oregon, and California, Volume IV: Bignoniaceae to Compositae*. Stanford, CA: Stanford University Press.
- California Natural Diversity Database. 2010. Occurrence Report for *Cirsium fontinale* var. *campylon*. RareFind, Version 3.1.0 (Updated July 2010). Sacramento, CA: California Department of Fish and Game.
- Bevill, R.L., S.M. Louda, and L.M. Stanforth. 1999. Protection from natural enemies in managing rare plant species. *Conservation Biology* 13:1323–1331.
- Bossard, C.C., J.M. Randall, and M.C. Hoshowsky (eds.). 2000. *Invasive Plants of California's Wildlands*. University of California Press, Berkeley, CA.
- Goeden, R.D., and D.W. Ricker. 1986. Phytophagous insect faunas of the two most common native *Cirsium* thistles, *C. californicum* and *C. proteanum*, in southern California. *Annals of the Entomological Society of America* 79:953–962.
- Herr, J.C. 2000. Evaluating non-target effects: the thistle story, pp. 12-17. In Hoddle, M. (ed.). *Proceedings of the Second California Conference on Biological Control*. July 11–12, 2000, Riverside, California. University of California.
- Keil, D.J., and C.E. Turner. 1992. Taxonomic Notes on California Species of *Cirsium* (Asteraceae: Cardueae). *Phytologia* 73(4):312–317.

- . 1993. *Cirsium*. Pages 232–239 in J.C. Hickman (ed.), *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Louda, S.M. and C.W. O'Brien. 2002. Unexpected ecological effects of distributing the exotic weevil, *Larinus planus* (F.), for the biological control of Canada thistle. *Conservation Biology* 16:717–727.
- Munz, P.A. 1959. *A California Flora*. Berkeley, CA: University of California Press.
- Pilz, G.E. 1967. A study of the section *Dermatolepis* of the genus *Cirsium*. Master's thesis, San José State College, San José, California.
- Sharsmith, H.K. 1939. A New Species of *Cirsium* from California. *Madroño* 5:85–90.
- Turner, C.E. and J.C. Herr. 1996. Impact of *Rhinocyllus conicus* on a non-target, rare, native thistle (*Cirsium fontinale*) in California. Pp. 103 in V.C. Moran and J.H. Hoffman (eds.). Proceedings of the ninth international symposium on biological control of weeds. University of Cape Town, Stellenbosch, South Africa.
- Turner, C.E., R.W. Pemberton, and S.S. Rosenthal. 1987. Host utilization of native *Cirsium* thistles (Asteraceae) by the introduced weevil *Rhinocyllus conicus* (Coleoptera: Curculionidae) in California. *Environmental Entomology* 16:111–115.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.

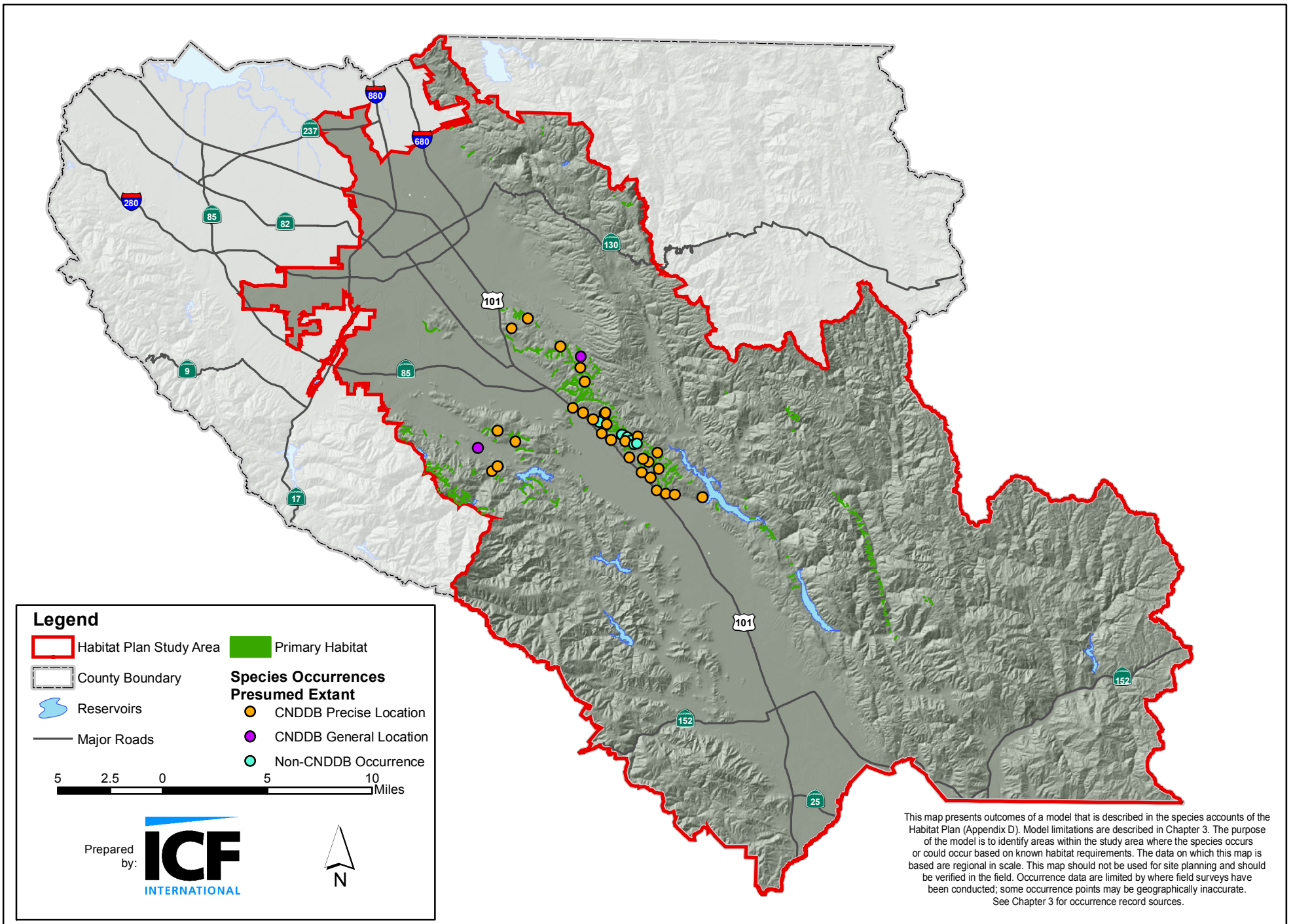
## Personal Communications

- Hillman, Janell. 2006. Botanist, Santa Clara Valley Water District, San José, CA. Comments on Draft Species Account.
- Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.
- Weiss, Stuart. Biologist. Field visit to Coyote Ridge, spring 2006.





**Figure 1**  
**Mount Hamilton Thistle (*Cirsium fontinale* var. *campylon*)**  
**Distribution in California**



**Figure 2**  
**Mount Hamilton Thistle Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**



## Santa Clara Valley Dudleya (*Dudleya abramsii* ssp. *setchellii*)

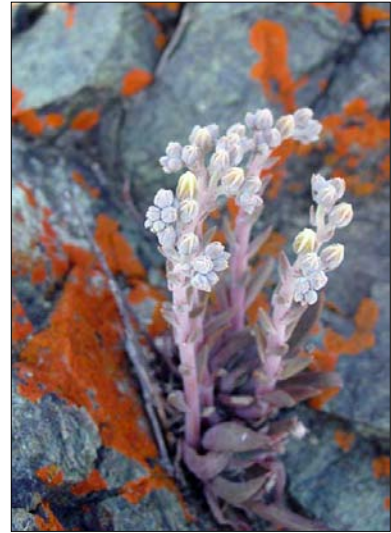
### Legal Status

**State:** California Native Plant Society 1B.1<sup>1</sup>

**Federal:** Endangered (U.S. Fish and Wildlife Service 1995)

**Critical Habitat:** None

**Recovery Planning:** *Recovery Plan for Serpentine Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)



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### Taxonomy

Santa Clara Valley dudleya was first collected by the famous botanist Willis Jepson on Tulare Hill at the turn of the last century (Jepson 1901). The species was originally described as *Cotyledon laxa* var. *setchelli*. In 1903, this taxa was elevated to full species status and transferred to the new genus *Dudleya* (Britton and Rose 1903). The taxa was subsequently reduced to the subspecies level as *Dudleya cymosa* ssp. *setchelli* (Moran 1959; Nakai 1987). It was elevated from subspecies to species level by Bartel in his treatment of the genus, resurrecting the original species name from 1903 (Hickman 1993). Most recently, it was again reduced to the subspecies level as *Dudleya abramsii* ssp. *setchellii* (Baldwin et al. 2012). Santa Clara Valley dudleya is a member of the stonecrop family (Crassulaceae).

### Description

Descriptions of the species' physical characteristics can be found in Hickman (1993) and in the *Recovery Plan for Serpentine Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). Santa Clara Valley dudleya is a perennial with succulent leaves one to three inches long and 0.3 to 0.6 inches wide. The species produces two to three flowering stalks up to 8 inches tall with pale yellow flowers in a terminal inflorescence.

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .1 means seriously endangered in California

## Distribution

### General

Santa Clara Valley dudleya is only found in Santa Clara County in the vicinity of Coyote Valley, from San José south about 20 miles to San Martin, at elevations of 300–900 feet (Figure 1).

### Occurrences within the Study Area

Two hundred and seven occurrences have been documented within the study area between 1989 and 2012, and all of these are presumed to be extant (Figure 2) (H.T. Harvey and Associates 2000; California Natural Diversity Database 2010, 2012; T. Marker pers. comm.). The estimated number of individuals known for the species varies greatly due in part to the variation in the methodology of counting the rosettes which are formed as individual plants spread vegetatively (Jones & Stokes 1998). Forty-nine occurrences were reported in the California Natural Diversity Database (20122012), 109 occurrences from the United Technologies Corporation (T. Marker pers. comm.), 48 occurrences from Santa Clara County Parks, and one from the Santa Clara Valley Water District.

An unconfirmed occurrence in the study area documented in 2006 is not included as a known occurrence (RCL Ecology Biological Consulting 2006). The occurrence was found near Highway 152 approximately 2 miles east of Casa de Fruta. There was no record of the occurrence in CNDDB and the identity of the plant has not been confirmed since its documentation. Still, this unconfirmed occurrence is significant as it was found further south than any other known occurrence.

## Natural History

### Habitat Requirements

Santa Clara Valley dudleya is restricted to rocky outcrops in serpentine grassland and oak woodland at elevations between 300 and 900 feet. McCarten (1993) suggests that suitable rock outcrops must have deep enough crevices for this species' roots, which are at least 6 inches long. Not all serpentine rock outcrops, therefore, may be suitable for Santa Clara Valley dudleya. Table 1 lists expected land cover associations for this species.

The rock outcrops where this species is found are otherwise largely unvegetated. However, adjacent serpentine grasslands typically are dominated by a mixture of native grasses, such as purple needlegrass (*Stipa* [*Nasella*] *pulchra*), and non-native grasses, such as wild oats (*Avena* spp.) and soft chess (*Bromus hordeaceus*). Native forbs are also common associates of this species, including lomatium (*Lomatium* spp.), soap plant (*Chlorogalum pomeridianum*), dwarf

plantain (*Plantago erecta*), California poppy (*Eschscholzia californica*), and naked buckwheat (*Eriogonum nudum*) (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2010). Santa Clara Valley dudleya may also occur on serpentine rock outcrops in oak woodland or savanna, where coast live oak (*Quercus agrifolia*) and valley oak (*Quercus lobata*) have been reported as associates (California Natural Diversity Database 2010).

**Table 1.** Habitat Associations for Santa Clara Valley Dudleya

Land Cover Type	Suitability	Rationale
Serpentine bunchgrass grassland	Moderate	Rock outcrops present in serpentine grassland may be below the minimum mapping unit size but still provide habitat.
Serpentine rock outcrop/barrens	High	Primary habitat for species (California Natural Diversity Database 2010; U.S. Fish and Wildlife Service 1998)
Valley oak woodland	Low	Reported from serpentine rock outcrops within Valley Oak savannah (California Natural Diversity Database 2010)
Coast live oak forest and woodland	Low	May occur on serpentine rock outcrops in cismontane woodland (California Native Plant Society 2006). Coast live oak is reported as an associate (California Natural Diversity Database 2010).
Mixed oak woodland and forest	Low	May occur on serpentine rock outcrops in cismontane woodland (California Native Plant Society 2006). Coast live oak is reported as an associate (California Natural Diversity Database 2010).

## Population Ecology

Santa Clara Valley dudleya produces wind-dispersed seeds (McCarten 1993), and also reproduces vegetatively by forming rosettes that either remain attached to the parent plant or separate from it. (Plants that remain attached to parents make counting unique individuals difficult.) Individual plants live for up to 10 years. Seedling germination is high in wet years, but seedling survival is low, often less than 5% (McCarten 1993; U.S. Fish and Wildlife Service 1998). The highest seedling survival rates were on east- and north-facing slopes, suggesting that dessication may be a major source of seedling mortality (McCarten 1993; Jones & Stokes 1998). Suitable microhabitats on rock outcrops (crevices with enough soil to retain moisture) may greatly limit the population size of this species. Table 2 shows key seasonal periods for Santa Clara Valley dudleya.

**Table 2.** Key Seasonal Periods for Santa Clara Valley Dudleya

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination (unknown)										✓	✓	✓
Flowering				✓	✓	✓	✓					
Fruiting (unknown)						✓	✓	✓				
Seed Dispersal (unknown)	(✓)	(✓)	(✓)	(✓)	(✓)	✓	✓	✓	(✓)	(✓)	(✓)	(✓)

Notes: (✓) Indicates seed dispersals period in some years



## Population Status and Trends

**Global:** *Stable?*

**State:** *Stable?*

**Within Study Area:** *Stable?*

Insufficient data are available to characterize long-term demographic trends within populations (California Natural Diversity Database 2010). However, it has been suggested that populations of Santa Clara Valley dudleya may be stable because of the stability of their microhabitats in crevices on serpentine rock outcrops (S. Weiss pers. comm.). Population monitoring is needed to confirm this hypothesis.

## Threats

The primary threats to Santa Clara Valley dudleya are overgrazing, development, and competition from non-native species (U.S. Fish and Wildlife Service 1998; Weiss 1999; California Native Plant Society 2006; California Natural Diversity Database 2010). Overcollecting is also a significant threat to Santa Clara Valley dudleya because of its attractiveness to collectors, accessible population sites, and slow growth rate (U.S. Fish and Wildlife Service 1995). Other threats may include feral pigs, off-road vehicle use, and foot traffic (California Native Plant Society 2006; California Natural Diversity Database 2010).

## Data Characterization

The general habitat requirements of Santa Clara Valley dudleya and the species distribution within its narrow range are relatively well understood. For example, a County-wide survey for this species was conducted in 2000 (H.T. Harvey and Associates 2000), and local botanists with the California Native Plant Society have been devoting significant attention to identifying and protecting local populations (D. Mayhall pers. comm.). The species' microhabitat requirements are not well understood, nor are the species' demography or pollination biology. The management needs of the species also need investigation.

## Existing Conservation Actions in the Study Area

The recovery plan for Santa Clara Valley dudleya calls for protection and management of extant populations, as well as educational outreach in the San José area and collection and banking of seed (U.S. Fish and Wildlife Service 1998). Recommended research topics to inform conservation efforts include research on the effects of vegetation management on the species, demographic and dispersal studies, and research on the efficacy of seed germination and propagation techniques.

Protection of mitigation lands on Coyote Ridge and other sites such as the Valley Christian High School site (Jones & Stokes 1998) have preserved some habitat for Santa Clara Valley dudleya.

## Modeled Habitat Distribution in Study Area

A habitat distribution model for Santa Clara Valley dudleya could not be developed because of the highly specialized and localized habitat requirements of the species. It is restricted to serpentine outcrops within annual grassland and oak woodland. However, only rock outcrops with sufficient crevice depth and soil depth within these crevices are likely to support the species. Serpentine rock outcrops were mapped in the study area, but only the largest outcrops were visible on the aerial photographs. This land cover type is therefore likely underrepresented on the land cover map. This species has received significant attention by the local botanical community in the last 5–10 years, particularly leading up to and since listing the species as endangered in 1995. As a result, the species' distribution is assumed to be well understood, and many large populations are known and mapped. New populations are still being discovered and it is likely that there are many unknown populations, the discovery of which will expand our estimate of total population size. However, because this species is relatively easily located and locally somewhat widespread, there is less need for a habitat distribution model to predict unknown occurrences.

## Literature Cited

### Printed References

- Baldwin, B.G, D.H. Goldman, D.J. Keil, R. Patterson, T. J. Rosatti, and D.H. Wilken, editors. 2012. *The Jepson Manual: Vascular Plants of California*, second edition. University of California Press, Berkeley, CA.
- Britton, N.L., and J.N. Rose. 1903. New or noteworthy North American Crassulaceae. *Bulletin of the New York Botanic Garden* 3: 1–45.
- California Native Plant Society. 2006. *Inventory of Rare and Endangered Plants* (online edition, v7-06a). Sacramento, CA: California Native Plant Society. Available: <<http://www.cnps.org/inventory>>. Accessed: March 2, 2006.
- California Natural Diversity Database. 2012. Occurrence Report for *Dudleya setchellii*. RareFind, Version 3.1.0 (Updated April 2012). Sacramento, CA: California Department of Fish and Game.

- California Natural Diversity Database. 2010. Occurrence Report for *Dudleya setchellii*. RareFind, Version 3.1.0 (Updated July 2010). Sacramento, CA: California Department of Fish and Game.
- H.T. Harvey & Associates. 2000. *Santa Clara Valley Dudleya* (*Dudleya setchellii*) *Countywide Survey*. (Project No. 873-05.) Report prepared for Peter Dunne, Standard Pacific, Los Gatos, California. November 7, 2000, 27+ pp., figs.
- Hickman, J.C. 1993. *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Jepson, W.L. 1901. *Flora of western middle California*. Encina Publishing Company, Berkeley, CA. 625pp.
- Jones & Stokes Associates. 1998. Final mitigation plan for the Valley Christian School, San José, CA. Prepared for the City of San José.
- Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne. McCarten, N. 1993. *Petition to the California State Fish and Game Commission: Dudleya setchellii*.
- Moran, R. 1959. *Dudleya*. In: H. Jacobsen, editor. *A Handbook of Succulent Plants*. Blandsford Press, London.
- Morin, N.R. 2007. New Combinations in *Dudleya* (Crassulaceae) and *Ribes* (Grossulariaceae). *Journal of Botanical Research Institute of Texas* 1(2): 1015–1016.
- Nakai, K. 1987. Some new and reconsidered California *Dudleya* (Crassulaceae). *Madroño*. 34:334–353.
- RCL Ecology Biological Consulting. 2006. Biological Resources Report Lands of Malech, Santa Clara County, CA. August 2006. Prepared for Ray Malech.
- U.S. Fish and Wildlife Service. 1995. *Determination of Endangered Status for Ten Plants and Threatened Status for Two Plants From Serpentine Habitats in the San Francisco Bay Region of California, Final rule*. 50 CFR Part 17, RIN: 1018–AB88.
- . 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.
- Weiss, S.B. 1999. Cars, Cows, and Checkerspot Butterflies: Nitrogen Deposition and Management of Nutrient-Poor Grasslands for a Threatened Species. *Conservation Biology* 13(6):1476–1486.

## Personal Communications

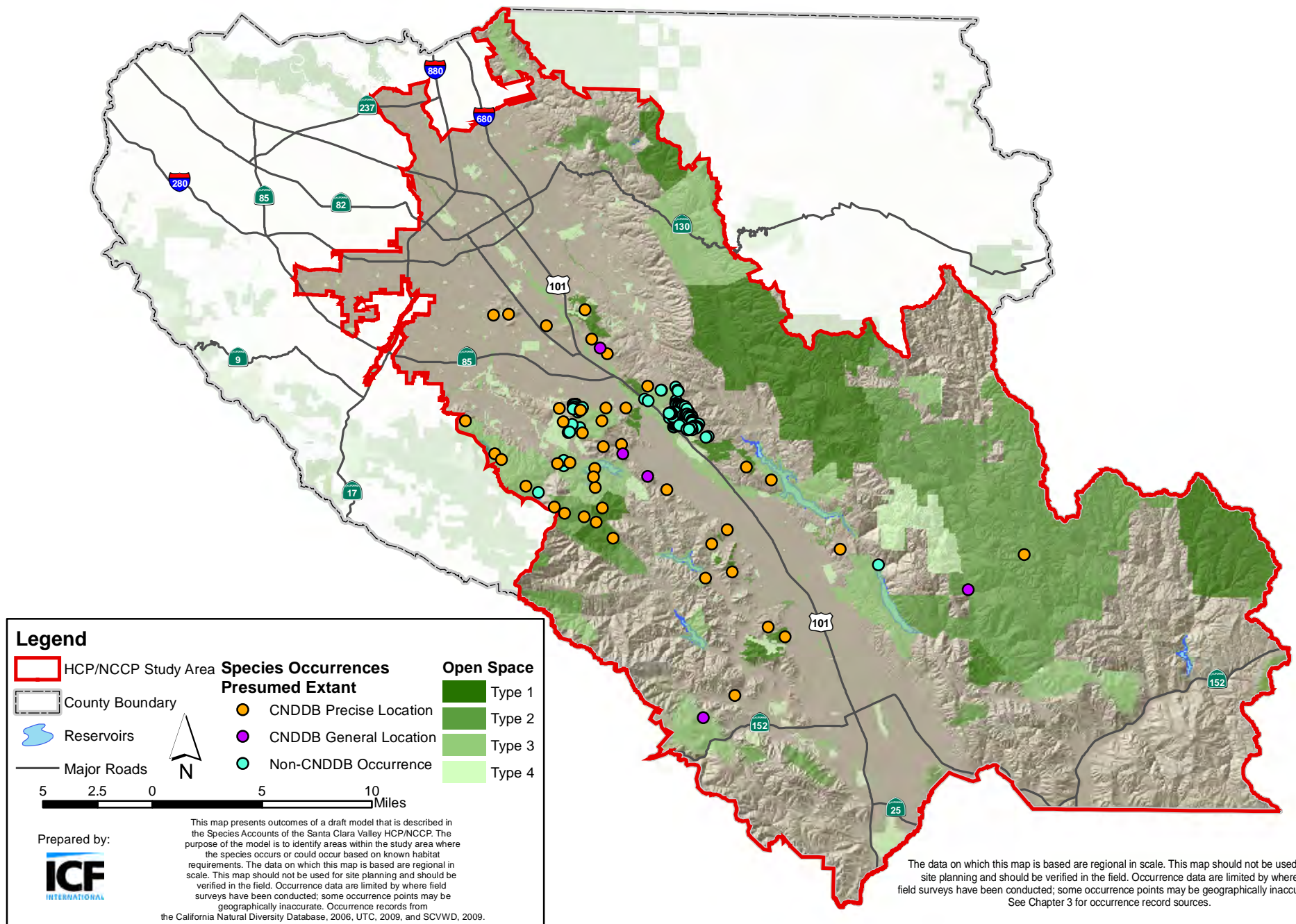
Marker, Timothy. Manager of environmental engineering. Pratt & Whitney Rocketdyne. January 22, 2007—Monitoring data provided in a letter to Jones & Stokes from United Technologies Corporation-Pratt & Whitney Rocketdyne.

Mayhall, D. 2005. California Native Plant Society, Santa Clara Valley Chapter.

Weiss, S.B. 2006. Consulting Biologist. Discussion on field tour of Coyote Ridge, spring.







**Figure 2**  
**Santa Clara Valley Dudleya Occurrence Records - Santa Clara Valley Habitat Plan**



## Fragrant Fritillary (*Fritillaria liliacea* Lindl.)

### Legal Status

**State:** California Native Plant Society List 1B.2<sup>1</sup>

**Federal:** None

**Critical Habitat:** None

**Recovery Planning:** None



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### Taxonomy

Fragrant fritillary (*Fritillaria liliacea*) is the accepted nomenclature. See *Madroño* 7:133–159 (1944) for revised nomenclature (Corelli and Chandik 1995). Fragrant fritillary is in the lily family (Liliaceae).

### Description

Descriptions of the species' physical characteristics can be found in Baranova (1981); Hickman (1993), and in Corelli and Chandik (1995). Fragrant fritillary, a bulbiferous monocot, is a perennial herb possessing a white flower that grows up to 35 cm in height (Calflora 2006; Hickman 1993). The lower leaves are opposite, mostly basal, and somewhat succulent while the upper leaves are alternate and smaller (Corelli and Chandik 1995).

### Distribution

#### General

Fragrant fritillary is known from 59 occurrences (California Natural Diversity Data Base 2006) throughout its range. It is endemic to western central California, ranging from Sonoma and Solano Counties south to Monterey County (Figure 1, California Natural Diversity Database 2006).

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .2 means fairly endangered in California.



## Occurrences within the Study Area

### Historical

A specimen of fragrant fritillary was collected prior to 1941 in Alum Rock Park in the vicinity of the Alum Rock Spring (California Natural Diversity Database occurrence #33). A survey of this area conducted in 1994 found the habitat extant, but failed to locate any occurrences of the species, so the current status of this population is unknown (California Natural Diversity Database 2006).

### Extant

There are eight reported occurrences of fragrant fritillary in the study area (Figure 2, California Natural Diversity Database 2010). Four occurrences are located on private land. Three of these (#25–27) are located east of Santa Clara Valley, southeast of Metcalf Canyon and less than a mile south or southeast from Metcalf VABM (Vertical Angle Benchmark, U.S. Geological Survey Morgan Hill quad) while one lies southwest of Metcalf VABM (#54). Two occurrences (#30 and 31) are located on County-owned parkland. Occurrence #30 was recorded in Calero County Park, near the south arm of Calero Reservoir while occurrence #31 was documented in Almaden Quicksilver County Park. Occurrence #32 was noted on private land about 1.5 miles south from the town of Evergreen, east of San José.

## Natural History

### Habitat Requirements

Fragrant fritillary occurs in grasslands, woodland, and coastal scrub up to 1,345 feet (California Natural Diversity Database 2006; California Native Plant Society 2006) and in vernal pool areas (California Natural Diversity Database 2006; Sawyer and Keeler-Wolf 1995). The species typically occurs on serpentine soils, although occurrences on heavy clay soils and other soil types have also been reported (California Natural Diversity Database 2006). Serpentine grasslands in the study area are the most likely habitat for this species (Table 1). Some species commonly associated with fragrant fritillary are purple needlegrass (*Stipa* [*Nassella*] *pulchra*), blue dicks (*Dichelostemma capitatum*), soap plant (*Chlorogalum pomeridianum*), sun cups (*Taraxia* [*Camissonia*] *ovata*), purple clarkia (*Clarkia purpurea*), and coyote brush (*Baccharis pilularis*) (Corellia and Chandik 1995; California Natural Diversity Database 2006).

**Table 1.** Habitat Associations for Fragrant Fritillary

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Serpentine Bunchgrass Grassland	Primary	Often on serpentine grasslands between 10 and 1,345 feet in elevation.	Unknown	California Natural Diversity Database 2006
California Annual Grassland; Northern Coastal Scrub/Diablan sage scrub; Valley Oak Woodland; Mixed Oak Woodland; Blue Oak Woodland; Coast live Oak Woodland; Seasonal Wetlands	Secondary	Various soil types though most often clay, including serpentine, between 10 and 1,345 feet elevation	Unknown	California Natural Diversity Database 2006

## Population Ecology

The population ecology of fragrant fritillary is largely unknown. The blooming period of this species is very early in the season (Table 2).

**Table 2.** Key Seasonal Periods for Fragrant Fritillary

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination										✓	✓	✓
Flowering		✓	✓	✓								
Fruiting			✓	✓	✓							
Seed Dispersal						✓	✓	✓				

## Population Status and Trends

**Global:** Declining (NatureServe 2006)

**State:** Declining (NatureServe 2006)

**Within Study Area:** Unknown

Nine documented occurrences of fragrant fritillary are believed to be extirpated in the state as a whole (California Natural Diversity Database 2006). Two populations are reported as stable and two as decreasing, but population trends for the other occurrences are unknown (California Natural Diversity Database 2006). For 21 occurrences, the habitat in which fragrant fritillary occurs is rated good to excellent, suggesting that the populations are likely to be stable. Habitat quality is rated as fair for 10 occurrences and unknown for 18 occurrences. The population sizes of fragrant fritillary in the study area are unknown. Population

sizes reported for the species in Solano County on the Jepson Prairie Preserve range from 20 to 100 plants (LSA 2005).

## Threats

Some common threats to fragrant fritillary are loss of habitat to urban development and agriculture (Corelli and Chandik 1995), competition from invasive exotic species, and grazing (California Natural Diversity Database 2006). In Santa Clara County, additional threats are from recreation and feral pigs (California Natural Diversity Database 2006).

## Data Characterization

Very little information is available for fragrant fritillary. The literature on the species pertains primarily to its taxonomy. The main sources of general information on this species are the *Jepson Manual* (Hickman 1993) and the California Native Plant Society (California Native Plant Society 2006). Specific observations on habitat and plant associates, threats, and other factors are present in the California Natural Diversity Data Base (California Natural Diversity Database 2006).

## Existing Conservation Actions in the Study Area

No conservation actions have been implemented or are planned in the study area that target fragrant fritillary. A recovery plan for the serpentine soil species of the San Francisco Bay Area was compiled in 1998 in which can be found specific management efforts being carried out in the Bay Area. Fragrant fritillary is included as a frequent associate of some of these species (U.S. Fish and Wildlife Service 1998).

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

1. Primary habitat is defined as serpentine bunchgrass grassland between 0 and 1,500 feet elevation on slopes with all degrees of steepness.
2. Secondary habitat is defined as annual grassland, northern coastal scrub/Diablan sage scrub, and all oak woodland land cover types on slopes with all degrees of steepness between 0 and 1,500 feet elevation.

Both types of suitable habitat apply in the following ecoregion subsections: Fremont-Livermore Hills and Valleys, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and Diablo Range.

## Rationale

Fragrant fritillary occurs primarily on serpentine soils in grasslands (California Natural Diversity Database 2006). The species also occurs on non-serpentine soils in grasslands, oak woodland, and coastal scrub up to 1,345 feet (California Natural Diversity Database 2006; California Native Plant Society 2006).

## Model Results

Figure 2 shows the modeled potential habitat for fragrant fritillary within the study area. Suitable habitat is found in the foothills on the east and west sides of the valley floor. Most of the modeled habitat is secondary habitat for this species. All eight known occurrences in the study area are located on modeled habitat.

## Literature Cited

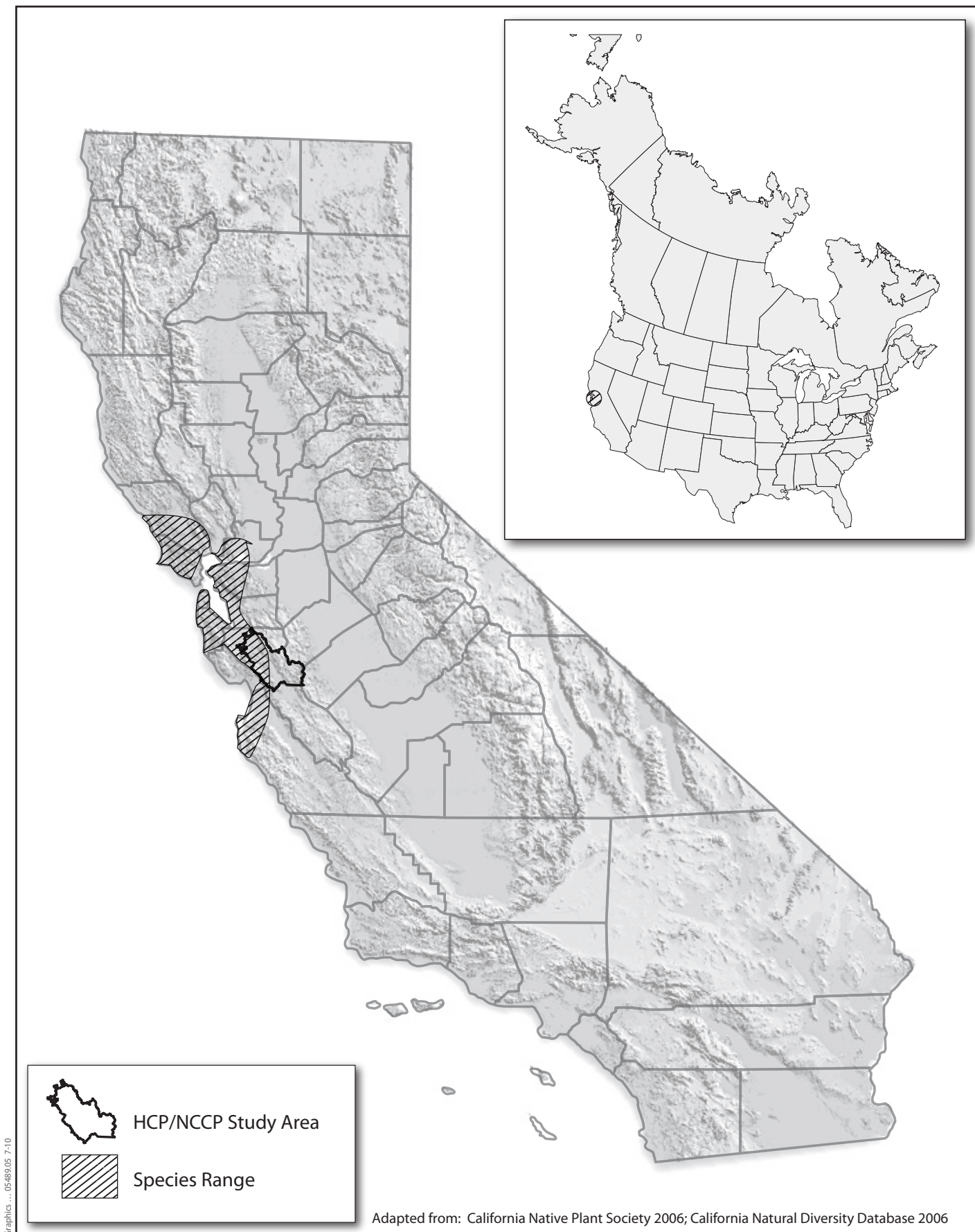
- Baranova, M.V. 1981. Ecological and morphological features of underground organs of the representatives of the genus *Fritillaria* (Liliaceae). *Botanicheskii Zhurnal* 66(10): 1369–1387.
- Calflora: Information on California plants for education, research and conservation. [web application]. 2006. Berkeley, California: The Calflora Database. Available: <<http://www.calflora.org/>>. Accessed: March 03, 2006).
- California Native Plant Society. 2006. Inventory of Rare and Endangered Plants (online edition, v7-06a). California Native Plant Society. Sacramento, CA. Available: <<http://www.cnps.org/inventory>>. Accessed: March. 3, 2006.
- California Natural Diversity Database. 2006. Occurrence Report for *Fritillaria liliaceae*. RareFind, Version 3.0.5 (Updated March 31, 2006). California Department of Fish and Game, Sacramento, CA.
- Corelli, T. and Chandik, Z. 1995. *The Rare and Endangered Plants of San Mateo and Santa Clara County*. Monocot Press, Half Moon Bay, CA.
- Hickman J.C. (ed.). *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.

LSA, Inc. 2005. Administrative Draft Solano County Habitat Conservation Plan. Prepared for the Solano County Water Agency. Available: <[www.scwa2.com/hcp](http://www.scwa2.com/hcp)>.

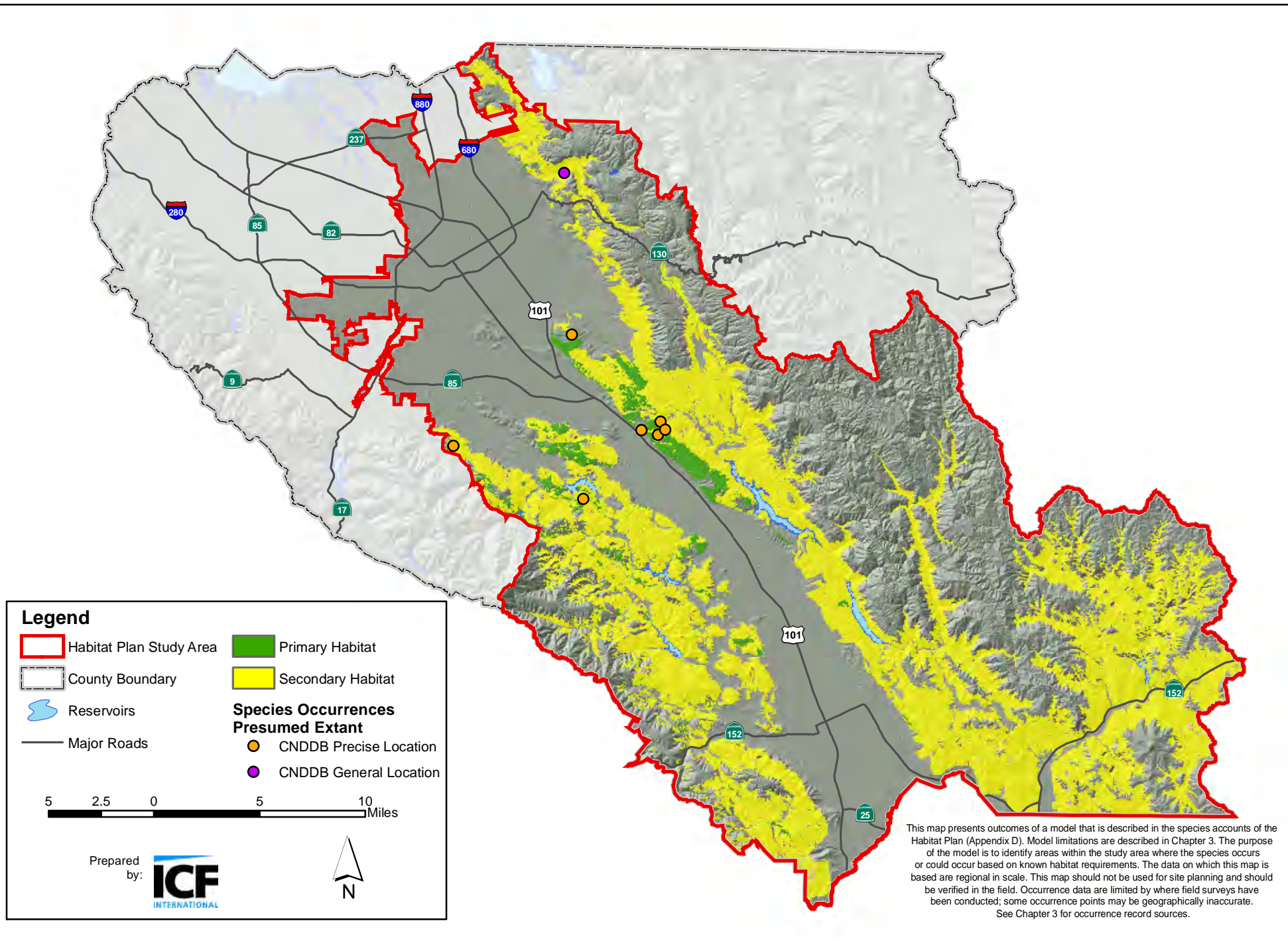
NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.6. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: March 3, 2006.

Sawyer and Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.







**Figure 2**  
**Fragrant Fritillary Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Loma Prieta Hoita (*Hoita strobilina*)

### Legal Status

**State:** California Native Plant Society  
List 1B.1<sup>1</sup>

**Federal:** None

**Critical Habitat:** N/A

**Recovery Planning:** N/A



### Taxonomy

Loma Prieta hoita was originally described in 1838 as *Psoralea strobilina*, based on collections made in California during the expedition led by Captain Frederick Beechey to the Pacific and Bering Strait from 1825 to 1828 (Hooker and Arnott 1838: 332). Rydberg (1919: 11) later transferred the species to *Hoita*. Rydberg's recognition of the genus *Hoita* was not generally accepted until recently (Grimes 1990). Loma Prieta hoita is in the legume family (Fabaceae).

### Description

Descriptions of the species' physical characteristics can be found in Rydberg (1919: 11), Abrams (1944: 554, Figure 2753), Munz (1959: 852), and Grimes (1993: 610). Loma Prieta hoita is herbaceous plant up to three feet tall with three leaflets per leaf and dense terminal clusters of purple flowers. This species is distinguished from other species of *Hoita* by the length and structure of the calyx lobes and flower petals.

### Distribution

#### General

Loma Prieta hoita is endemic to California, where it occurs primarily in the Santa Cruz Mountains of Santa Clara and Santa Cruz Counties (Figure 1). The species also occurs in the Diablo Range in Santa Clara, Alameda, and Contra Costa Counties. There are 26 known occurrences of Loma Prieta hoita (California Natural Diversity Database 2006).

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .1 means seriously endangered in California.



## Occurrences within the Study Area

### Historical

Two historic occurrences (California Natural Diversity Database Occurrences #2 and 3) were recorded from near Gilroy (California Natural Diversity Database 2006).

### Extant

Fourteen occurrences of Loma Prieta hoita have been reported from the study area (California Natural Diversity Database 2010). Three occurrences are located in Almaden Quicksilver County Park (California Natural Diversity Database Occurrence #5, #23, and #24). An occurrence consisting of three colonies was reported from Santa Teresa County Park (California Natural Diversity Database Occurrence #6). Two occurrences were reported from the hills east of Coyote Creek, one on private land and one on land of unknown ownership (California Natural Diversity Database Occurrence #10 and #11 respectively). Three occurrences were reported from Rancho Cañada del Oro Open Space Preserve (California Natural Diversity Database Occurrence #13, #25, and #26). One occurrence was reported in the vicinity of Chesbro Reservoir (California Natural Diversity Database Occurrence #16). One occurrence was reported from along Javelina Loop Trail in Calero County Park (California Natural Diversity Database Occurrence #22). Three new occurrences were added from field data collected by Tom Cochrane and John Folkowski at Santa Clara County Parks (2010): One occurrence within Rancho San Vicente and two just east of Almaden Quicksilver Park boundaries.

Two additional occurrences are outside the study area east of Highway 17, including one reported in 2004 at Sierra Azul Open Space Preserve (California Natural Diversity Database Occurrence #12). In addition, collections made on Loma Prieta Peak and at the head of Uvas Creek on lands of unknown ownership (California Natural Diversity Database Occurrence #4) may be within the study area. Figure 2 shows the locations of these occurrences.

## Natural History

### Habitat Requirements

Loma Prieta hoita generally occurs as an understory element of coast live oak forest and woodland, generally in riparian woodland or on shaded slopes, between 100 and 2,000 feet elevation. Coast live oak (*Quercus agrifolia*) is the dominant canopy tree, associated with California bay (*Umbellularia californica*), valley oak (*Quercus lobata*), or white alder (*Alnus rhombifolia*). The understory is often shrubby, composed of poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), big-berry manzanita (*Arctostaphylos glauca*), bush monkeyflower (*Mimulus aurantiacus*), and coffeeberry (*Frangula [Rhamnus]*)

spp.). Although the California Natural Diversity Database reports that the species sometimes occurs in chaparral or on serpentine (California Natural Diversity Database 2006), other sources note that this species primarily occurs on and is a strong indicator species for serpentine soils (Safford et al. 2005, California Native Plant Society 2012). Within the study area it seems to occur primarily on serpentine and secondarily on non-serpentine (J. Hillman pers. comm.). It also often occurs in the riparian zone. Generalized habitat requirements are shown in Table 1.

**Table 1.** Habitat Associations for Loma Prieta Hoita

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Coast Live Oak Forest and Woodland; Mixed Oak Woodland	Primary	Primarily on serpentine soils on shaded slopes or along streams, between 100 and 2,000 feet elevation	Unknown	California Natural Diversity Database 2006; J. Hillman pers. comm.
Northern Mixed Chaparral/Chamise Chaparral	Secondary	All soil types, including serpentine between 100 and 2,000 feet elevation	Unknown, but possibly low	California Natural Diversity Database 2006

## Population Ecology

Populations generally consist of one to several stands composed of about a hundred plants, sometimes with up to a thousand plants in a stand (California Natural Diversity Database 2006). Key seasonal periods for the species are shown in Table 2.

**Table 2.** Key Seasonal Periods for Loma Prieta Hoita

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓	✓							✓	✓	✓
Flowering					(✓)	✓	✓	✓	✓	(✓)		
Fruiting							✓	✓	✓	✓	✓	
Seed Dispersal	✓						✓	✓	✓	✓	✓	✓

Notes: Months in parentheses are uncommon periods.

## Population Status and Trends

**Global:** *Unknown* (California Natural Diversity Database 2006)

**State:** *Unknown* (California Natural Diversity Database 2006)

**Within Study Area:** *Unknown* (California Natural Diversity Database 2006)

All but one occurrence of Loma Prieta hoita are presumed to be extant (California Natural Diversity Database 2006). One of the occurrences near Gilroy (California Natural Diversity Database occurrence #2) has possibly been extirpated.

## Threats

Few population threats are known for Loma Prieta hoita. Populations at roadsides or in power line rights-of-way are subject to vegetation clearing. At least one population is reported to be subject to cattle grazing and trampling and feral pig rooting. Wild pigs commonly root under oak canopies in the study area, severely disturbing the soil and uprooting most herbaceous plants. At least one population may be threatened by development.

## Data Characterization

Only 8 occurrences provide sufficient information to characterize the species' general habitat requirements. Very little data is available on the species' population biology, and no data is available on the management needs of the species. More information is also needed on threats to this species in the study area.

## Existing Conservation Actions in the Study Area

There are no known conservation actions in the study area focused on Loma Prieta hoita.

## Modeled Species Distribution in Study Area

### Model Description

#### Model Assumptions

1. Primary habitat is defined as mixed oak woodland and coast live oak forest and woodland between 100 and 2,000 feet in elevation on slopes with all degrees of steepness and in all soil types but primarily on serpentine soils.
2. Secondary habitat is defined as northern mixed chaparral/chamise chaparral and mixed serpentine chaparral between 0 and 2,000 feet in elevation on slopes with all degrees of steepness. Northern mixed chaparral applies in all soil types.

Potential ecoregion subsections include the Fremont-Livermore Hills and Valleys, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and the Diablo Range (i.e., all ecoregions except the Santa Clara Valley).

## Rationale

Loma Prieta hoita occurs as an understory element of oak woodland between 100 and 2,000 feet elevation, on shaded slopes or in riparian areas. The species associated with Loma Prieta hoita correspond with the coast live oak woodland and mixed oak woodland land cover types. Secondary habitat appears to be mixed northern chaparral and mixed serpentine chaparral.

## Model Results

Figure 2 shows the modeled potential habitat for Loma Prieta hoita within the study area. The potential habitat is spread throughout the study area, with the exception of the valley floor. The known occurrences of this species within the study area fall within the modeled habitat.

## Literature Cited

- Abrams, L. 1944. *Illustrated Flora of the Pacific States, Volume II: Polygonaceae to Krameriaceae*. Stanford, CA: Stanford University Press.
- California Natural Diversity Database. 2010. Occurrence Report for *Hoita strobilina*. RareFind, Version 3.0.5 (Updated July 2010). Sacramento, CA: California Department of Fish and Game.
- California Native Plant Society. 2012. Inventory of Rare and Endangered Plants (Online Edition v8-01a). California Native Plant Society, Sacramento, CA. Accessed: February 2012.
- Grimes, J.W. 1990. A Revision of the New World Species of the Psoraleeae (Leguminosae: Papilionoideae). *Memoirs of the New York Botanical Garden* 61:1–114.
- Grimes, J.W. 1993. Hoita. Page 610 in J.C. Hickman (ed.), *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Hooker, W.J., and G.A. Arnott. 1838. *The Botany of Captain Beechey's Voyage—California Supplement*. (1965 Reprint). Weinheim, NY: J. Cramer.
- Munz, P.A. 1959. *A California Flora*. Berkeley, CA: University of California Press.

Rydberg, P.A. 1919. Fabaceae: Psoraleae. *North American Flora* 24 (Part 1):1–64.

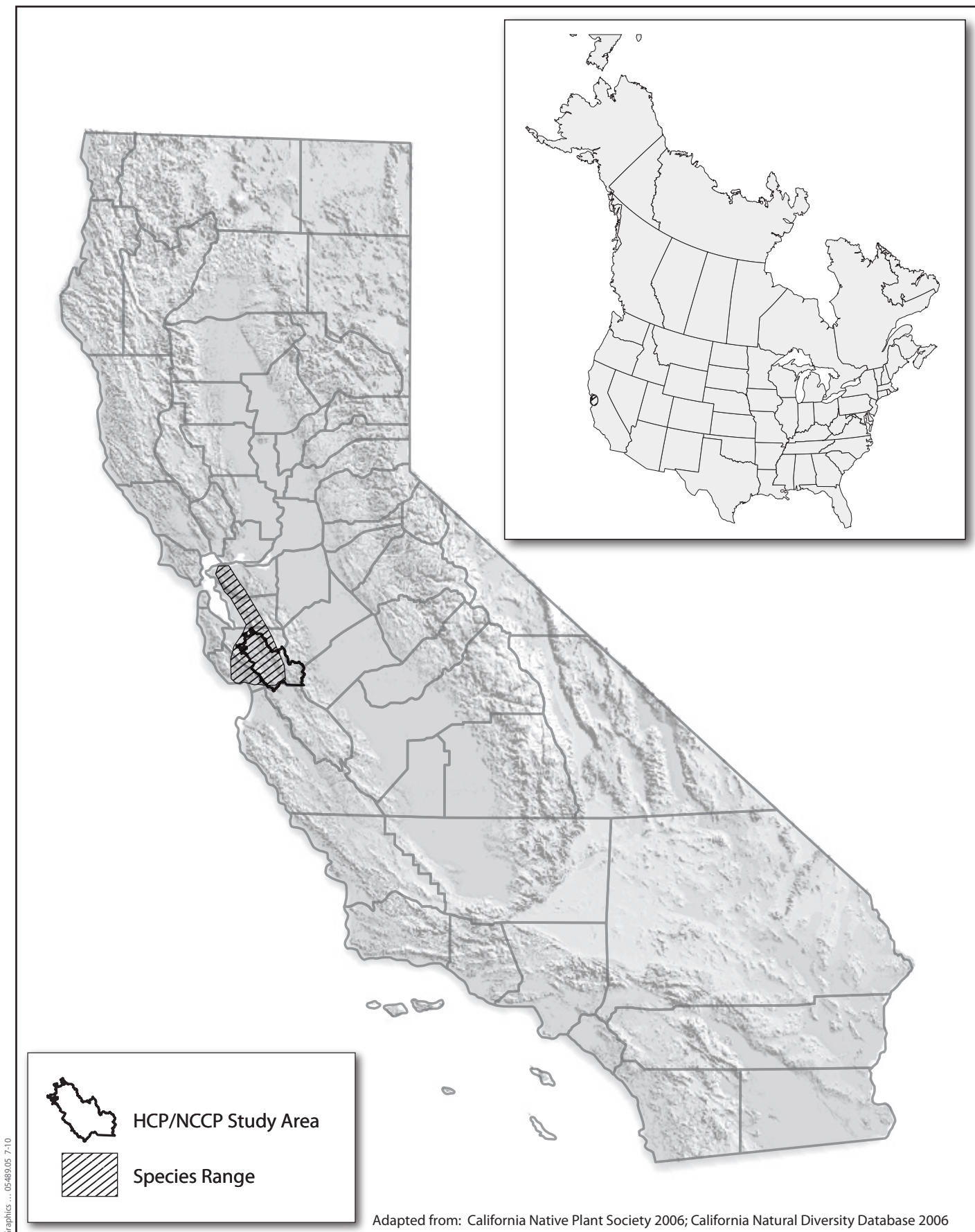
Safford, H.D., J.H. Viers, and S.P. Harrison. 2005. Serpentine endemism in the California flora: a database of serpentine affinity. *Madroño* 52:222–257.

## Personal Communications

Tom Cochrane. CNPS Volunteer. Email correspondence to Rebecca Sloan, August 1, 2010.

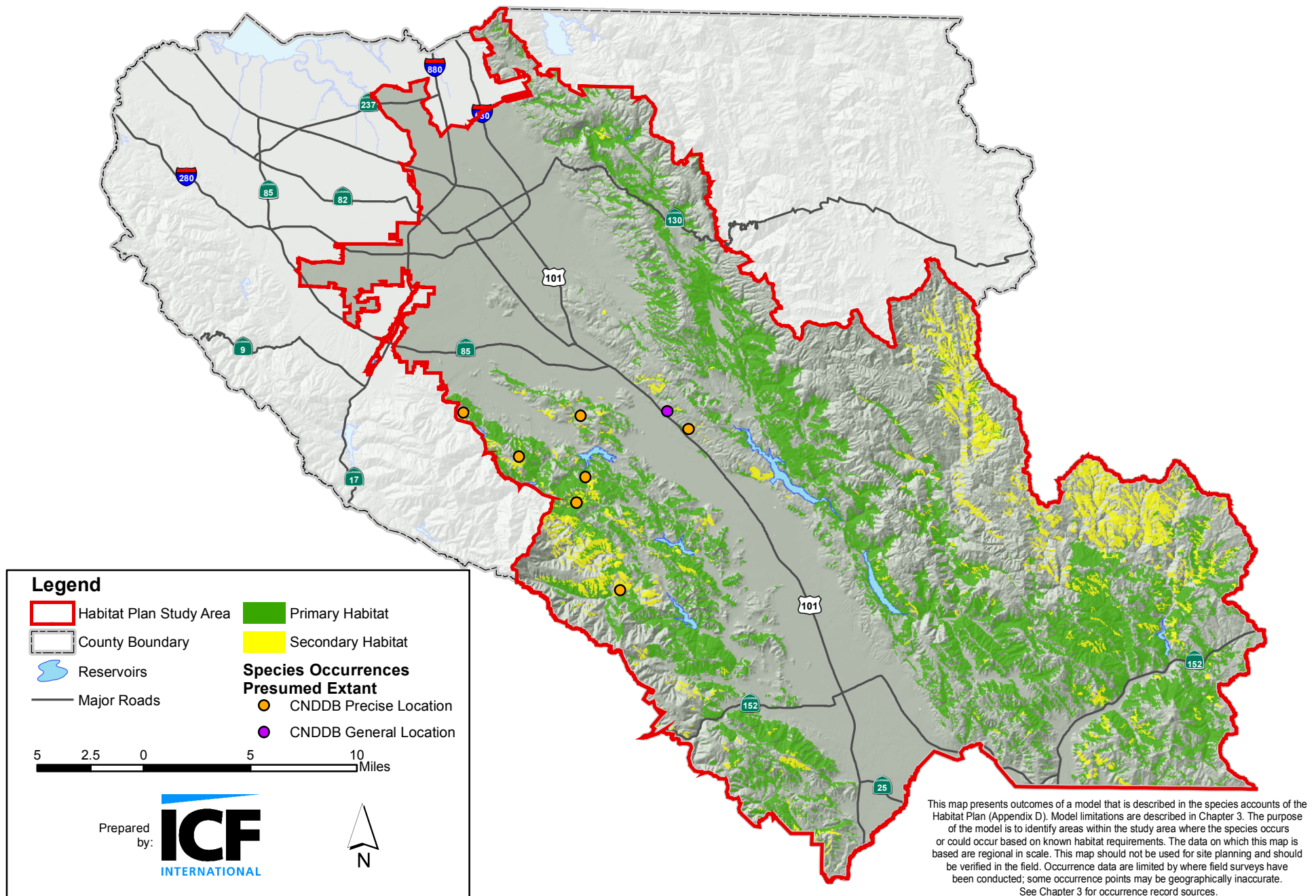
John Folkowski. GIS Analyst. Santa Clara County Parks and Recreation. Email correspondence to David Zippin, July 21, 2010.

Janell Hillman. Botanist, Santa Clara Valley Water District. Email correspondence to David Zippin, October 18, 2006.



**Figure 1**  
**Loma Prieta Hoita (*Hoita strobilina*)**  
**Distribution in California**





**Figure 2**  
**Loma Prieta Hoita Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Smooth Lessingia (*Lessingia micradenia* var. *glabrata*)

### Legal Status

**State:** California Native Plant Society  
List 1B.2<sup>1</sup>

**Federal:** None

**Critical Habitat:** N/A

**Recovery Planning:** U.S. Fish and Wildlife  
Service (1998)



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### Taxonomy

Smooth lessingia was originally described by D.D. Keck, based on a collection from the Santa Cruz Mountains between Los Gatos and Almaden, in Santa Clara County (Keck 1958: 105). It was originally described as *Lessingia ramulosa* var. *glabrata*. Keck (1958: 105) characterized var. *glabrata* as “exactly like *L. ramulosa* var. *micradenia*” except that var. *glabrata* lacked glandular hairs. Ferris (1958: 101) subsequently raised var. *micradenia* to species rank and transferred var. *glabrata* to *L. micradenia*, recombining the name as *Lessingia micradenia* var. *glabrata*. Smooth lessingia is in the sunflower family (Asteraceae).

### Description

Descriptions of the species’ physical characteristics can be found in Keck (1958: 105), Munz (1959: 1223), Abrams and Ferris (1960: 379), and Lane (1993: 306). Smooth lessingia is an annual herb that grows up to 60 cm tall. It has deciduous basal leaves less than 6 centimeters (cm) long, and linear leaves along the stem up to only 2 cm long. Smooth lessingia is distinguished from the related Tamalpais lessingia (*Lessingia micradenia* var. *micradenia*) by its three to five flowers per flower head.

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .2 means fairly endangered in California.



## Distribution

### General

Smooth lessingia is endemic to Santa Clara County on the eastern slopes of the Santa Cruz Mountains and the hills adjacent to the Santa Clara Valley (Figure 1). There are 39 known occurrences of smooth lessingia (California Natural Diversity Database 2008), all within the study area.

## Occurrences within the Study Area

### Historical

Four historical occurrences of smooth lessingia are known from the study area (California Natural Diversity Database 2006). These include occurrences reported from 1.5 miles southwest of San Martin in 1926 (California Natural Diversity Database Occurrence #1), from the eastern slope of Loma Prieta in 1893 (California Natural Diversity Database Occurrence #2), from north of Morgan Hill near Pigeon Point in 1937 (California Natural Diversity Database Occurrence #5), and from near Almaden in 1941 (California Natural Diversity Database Occurrence #9).

### Extant

There are thirty-nine extant occurrences of smooth lessingia within the study area, twenty-six of which are known from the California Natural Diversity Database (2008). The remaining occurrences were reported from the Santa Clara Valley Water District or Santa Clara County Parks and Recreation. Most of the smooth lessingia occurrences are located west of Highway 101 with the exception of several occurrences that occur directly adjacent to Highway 101 to the east. Occurrences occur primarily on private land although there are several occurrences in Santa Teresa County Park and one occurrence each in Calero and Mt. Madonna County Parks.

## Natural History

### Habitat Requirements

Smooth lessingia occurs on serpentine outcrops and in rocky soils in serpentine bunchgrass grassland. It appears to prefer areas with low vegetation cover, sometimes occurring on roadcuts or at roadsides. The occurrences range in elevation from 400 to 1,600 feet (Table 1).

Species associated with smooth lessingia include bigberry manzanita (*Arctostaphylos glauca*), common yarrow (*Achillea millefolium*), dwarf plantain

(*Plantago erecta*), golden yarrow (*Eriophyllum confertiflorum*), gypsum springbeauty (*Claytonia gypsophiloides*), hayfield tarweed (*Hemizonia congesta*), junegrass (*Koeleria macrantha*), miner's lettuce (*Claytonia perfoliata*), purple needlegrass (*Stipa* [*Nassella*] *pulchra*), serpentine linanthus (*Linanthus ambiguus*), serpentine sunflower (*Helianthus bolanderi*), streambank springbeauty (*Claytonia parviflora*), and yellow star thistle (*Centaurea solstitialis*) (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006).

**Table 1.** Habitat Associations for Smooth Lessingia

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Serpentine Bunchgrass Grassland	Primary	In areas with low vegetation cover, at 400 to 1,600 feet elevation	Unknown, but probably high	California Natural Diversity Database 2006
Serpentine Rock Outcrop	Primary	at 400 to 1,600 feet elevation	Unknown, but probably high	California Natural Diversity Database 2006

## Population Ecology

The ecology and demography of smooth lessingia is unknown and remains unstudied. Population size appears to vary considerably between occurrence sites. Four populations had fewer than 200 individuals, whereas three other populations were reported to contain tens of thousands of plants (California Natural Diversity Database 2006). Estimates of population density at two sites were 10-20 plants per square meter and 40–60 plants per square meter (California Natural Diversity Database 2006). Table 2 shows key seasonal periods for the species.

**Table 2.** Key Seasonal Periods for Smooth Lessingia

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓	✓	✓								✓
Flowering							✓	✓	✓	(✓)	(✓)	
Fruiting								✓	✓	✓	✓	✓
Seed Dispersal	✓								✓	✓	✓	✓

Note: Periods in parentheses are atypical.

## Population Status and Trends

**Global:** *Unknown* (California Natural Diversity Database 2006)

**State:** *Unknown* (California Natural Diversity Database 2006)

**Within Study Area:** *Unknown* (California Natural Diversity Database 2006)

All documented occurrences of smooth lessingia are presumed to be extant (California Natural Diversity Database 2006).

## Threats

Reported threats to populations of smooth lessingia in the study area include cattle grazing, foot traffic (trampling), competition from invasive exotic plants, and road and trail maintenance (California Natural Diversity Database 2006).

## Data Characterization

Only 8 occurrences provide substantial information on the habitat in which the species has been found, but the available information is not likely to adequately characterize the species' habitat requirements. Very little data is available on the species' population biology, and no data is available on the management needs of the species. More information is also needed on threats to this species in the study area.

## Existing Conservation Actions in the Study Area

There are no conservation actions in the study area that are focused on the conservation of smooth lessingia.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

Suitable habitat for smooth lessingia is defined as serpentine bunchgrass grassland and serpentine rock outcrops between 0 and 2,000 feet in elevation on slopes with all degrees of steepness. Potential ecoregions include the Fremont-Livermore Hills and Valleys, Santa Clara Valley, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and Diablo Range.

## Rationale

Smooth lessingia is restricted to serpentine rock outcrops, serpentine roadcuts, and sparsely-vegetated serpentine grassland below 2,000 feet (California Natural Diversity Database 2006).

## Model Results

Modeled potential habitat for smooth lessingia is shown in Figure 2. The habitat is concentrated in the hills east of the Santa Clara Valley floor and north of Anderson Reservoir, and in scattered areas dominated by serpentinite-derived soils in the foothills of the Santa Cruz Mountains to the west of the valley floor. All of the known occurrences are mapped in Figure 2, and are found on modeled habitat (note that in some cases the modeled habitat is smaller than the size of the symbols in Figure 2).

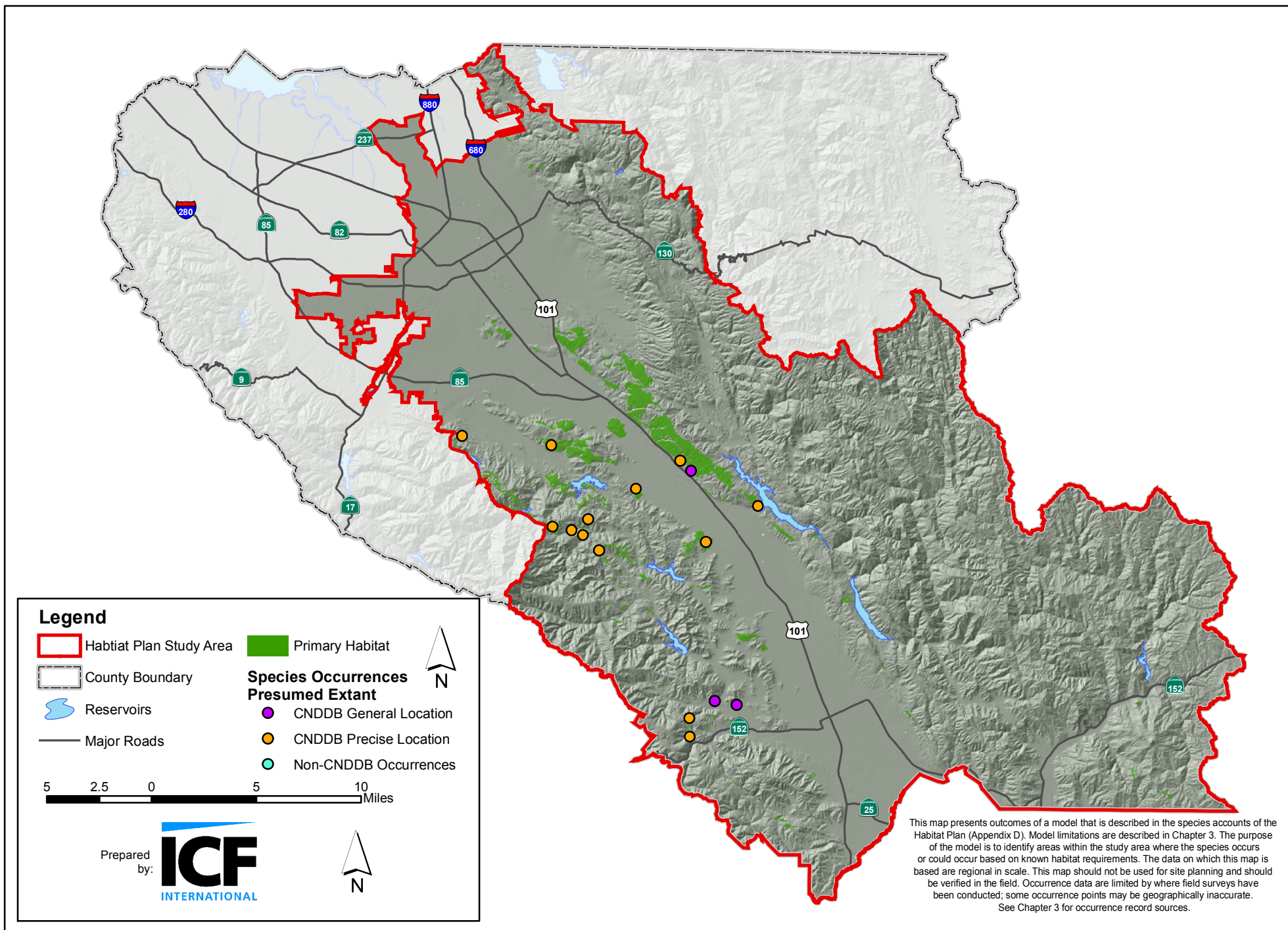
## Literature Cited

- Abrams, L., and R.M. Ferris. 1960. *Illustrated Flora of the Pacific States, Washington, Oregon, and California, Volume IV: Bignoniaceae to Compositae*. Stanford, CA: Stanford University Press.
- California Natural Diversity Database. 2008. Occurrence Report for *Lessingia micradenia* var. *glabrata*. RareFind, Version 3.0.5 (Updated May, 2008). Sacramento, CA: California Department of Fish and Game.
- Ferris, R.S. 1958. Taxonomic Notes on Western Plants. *Contributions from the Dudley Herbarium* 5:99–108.
- Keck, D.D. 1958. Taxonomic Notes on the California Flora. *Aliso* 4(1):101–114.
- Lane, M.A. 1993. *Lessingia*. Pages 304–306 in J.C. Hickman (ed.), *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Munz, P.A. 1959. *A California Flora*. Berkeley, CA: University of California Press.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp









**Figure 2**  
**Smooth Lessingia Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Metcalf Canyon Jewelflower (*Streptanthus albidus* ssp. *albidus*)

### Legal Status

**State:** California Native Plant Society 1B.1<sup>1</sup>

**Federal:** Endangered (U.S. Fish and Wildlife Service 1995)

**Critical Habitat:** None

**Recovery Planning:** *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)



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### Taxonomy

Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*) was first described by Edward Greene in 1887 (Greene 1887). It was grouped into the subgenus *Euclisia* and changed status with the subgenus. *Euclisia* became its own genus (Greene 1904) until Jepson (1925) moved it back to subgenus status. Jepson (1925) considered Metcalf Canyon jewelflower to be a subspecies of *S. glandulosus*. Kruckberg (1958) determined that *S. albidus* ssp. *albidus* was so distinct both morphologically and based on geologic restrictions that he recognized this species as separate from *S. glandulosus* and divided it into *S. albidus* ssp. *albidus* and *S. albidus* ssp. *peramoenus* (most beautiful jewelflower, another taxa covered by this Plan). These divisions are still recognized as accurate (Integrated Taxonomic Information System 2001; U.S. Fish and Wildlife Service 1998). Metcalf Canyon jewelflower is in the Brassicaceae, or mustard family. The only *Streptanthus* species likely to grow in the same area as Metcalf Canyon jewelflower is its close relative, most beautiful jewelflower, which is distinguished by its dark purple sepals.

### Description

Descriptions of the species' physical characteristics can be found in Buck et al. (1993), Corelli and Chandik (1995), and U.S. Fish and Wildlife Service (1998). Metcalf Canyon jewelflower is a wiry annual herb up to three feet tall possessing small flowers along the stem with white petals with purple veins. It has bristly hairs at the base and glaucous stems and leaves (U.S. Fish and Wildlife Service 1998).

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; 0.1 means seriously endangered in California.



## Distribution

### General

The range for Metcalf Canyon jewelflower is highly restricted and lies completely within Santa Clara County, extending approximately 20 miles from San José south to Anderson Lake (Figure 1; U.S. Fish and Wildlife Service 1998; California Native Plant Society 2006). Its current range is thought to be the same as its historic range (U.S. Fish and Wildlife Service 1998).

## Occurrences within the Study Area

### Historical

There are four historic reports of Metcalf Canyon jewelflower (California Natural Diversity Database 2006). One occurrence (California Natural Diversity Database occurrence #6) from 1895 may actually be a different species of *Streptanthus*. The second historic occurrence (#5) documented in 1937 has likely been extirpated because it is located in an area now covered by Anderson Lake. A third occurrence (#11) first documented in 1980 at Tulare Hill and updated again in 1995, was extirpated when the plants were covered by fill during construction of a housing development. A fourth occurrence was documented in Gilroy along Llagas Avenue in 1957 and has not been reported since (#16). There is some taxonomic uncertainty about this occurrence (U.S. Fish and Wildlife Service 1998).

### Extant

Eleven occurrences of Metcalf Canyon jewelflower in Santa Clara County are presumed extant (California Natural Diversity Database 2006), 10 of which are within the study area. Most of the occurrences are on the east side of Santa Clara Valley along U.S. 101 (Figure 2).

There are four occurrences on the west side of U.S. 101: CNDDDB occurrence numbers 6, 17, 19, and 21. CNDDDB occurrence 6 is located near Lexington Reservoir, is on Santa Clara County Parks land, and is outside the study area. Occurrence 17 is located on private land in San Jose and is assumed extant by the CNDDDB. Occurrence 19 is on Communication Hill in San Jose and is adjacent to an active quarry. This occurrence is expected to be impacted by activities not covered by this Plan. Occurrence 21 is a non-specific reference from 1992 and is located on private property.

The remaining seven occurrences are found on the eastern side of U.S. 101. CNDDDB occurrence numbers 18 and 20 are located on Type I open space. Occurrence number 15 is located near the Silver Creek Valley Country Club golf course. Occurrence numbers 8 and 4 are located in the Coyote Ridge area and are the two occurrences most likely to be impacted by SCVWD activities on the

Coyote Canal. Occurrence number 8 is located on Type 3 open space and occurrence 4 is located on private property. Occurrences 2 and 12 are also located on private property in the Coyote Ridge area.

## Natural History

### Habitat Requirements

Metcalf Canyon jewelflower is a serpentine endemic that can be found between 200 and 1,200 feet in elevation. It grows in serpentine grasslands and on serpentine outcrops and road cuts that have little soil development and are surrounded by grasslands (California Natural Diversity Database 2005; U.S. Fish and Wildlife Service 1998; Table 1). Commonly associated species are California sage (*Artemisia californica*), California poppy (*Eschscholzia californica*), foothill deer vetch (*Acmispon [Lotus] humistratus*), wild oats (*Avena fatua*) and a variety of other rare plants such as most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*), and Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*) (U.S. Fish and Wildlife Service 1998).

**Table 1.** Habitat Associations for Metcalf Canyon Jewelflower

Land Cover Type	Habitat Designation	Habitat Parameters	Percent Suitable	Rationale
Serpentine Bunchgrass Grassland	Primary habitat	Rocky outcrops and roadcuts with little soil development; 200–1,200 feet	High	U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006; California Native Plant Society 2006
Serpentine Rock Outcrop/Barrens	Primary habitat	200–1,200 feet	High	U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006; California Native Plant Society 2006

### Population Ecology

Very little is known about its life history stages and reproductive biology (U.S. Fish and Wildlife Service 1998). Metcalf Canyon jewelflower is closely related to most beautiful jewelflower (McCarten 1992 in U.S. Fish and Wildlife Service 1998). Based on chloroplast DNA studies, there is evidence that Metcalf Canyon jewelflower has recently evolved (neoendemic) (Mayer and Soltis 1994 in U.S. Fish and Wildlife Service 1998). Furthermore, studies have shown that there are genetic differences among the various populations of Metcalf Canyon jewelflower, which suggests that all populations are important to monitor and protect (Mayer et al. 1994 in U.S. Fish and Wildlife Service 1998). Key seasonal periods for this species are shown in Table 2.

Herbivory has been recorded on other species of *Streptanthus* in central Texas by white-tailed deer and insects such as pierid butterfly caterpillars. These herbivores can have substantial negative effects on plant growth, survival, reproduction, and population dynamics (Zippin 1997).

**Table 2.** Key Seasonal Periods for Metcalf Canyon Jewelflower

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓	✓							✓	✓	✓
Flowering				✓	✓	✓	✓					
Fruiting						✓	✓	✓	✓			
Seed Dispersal						✓	✓	✓	✓	✓	✓	✓

## Population Status and Trends

**Global:** Declining (NatureServe 2006)

**State:** Declining (NatureServe 2006)

**Study Area:** Unknown

Nine populations have been documented as having a total of 20,000 to 25,000 plants (McCarten 1992 in U.S. Fish and Wildlife Service 1998). The current status of these populations is unknown. Road construction through serpentine areas may create habitat for this species by exposing serpentine rock that can be colonized by Metcalf canyon jewelflower.

## Threats

Urban development and cattle grazing pose the greatest threats to Metcalf Canyon jewelflower (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006). Urban development has already eliminated at least one known population and planned developments have threatened others. Even if no direct impacts on these plants are anticipated, construction activities, human disturbance, and habitat fragmentation can all have a negative impact (U.S. Fish and Wildlife Service 1998). Cattle may trample and eat plants, leading to a decline in the overall population as well as to a decline in the soil seed bank if plants are eliminated prior to setting seed (U.S. Fish and Wildlife Service 1998). Plants found on steep roadcuts or large rock outcrops are likely inaccessible to cattle. Garbage dumping and off-road motorcycles are additional threats (U.S. Fish and Wildlife Service 1998). One site located next to an active quarry could be impacted by quarry-related activities (U.S. Fish and Wildlife Service 1998, California Natural Diversity Database 2006). At another site, expansion of a landfill poses a threat (California Natural Diversity Database 2006). Road maintenance and construction could also impact populations which occur on or near roadcuts and those found along roads (U.S. Fish and Wildlife Service 1998).

## Data Characterization

Very little information about the reproductive biology or demography of Metcalf Canyon jewelflower is available (U.S. Fish and Wildlife Service 1998).

## Existing Conservation Actions in the Study Area

There are no known conservation actions in the study that are focused on Metcalf Canyon jewelflower. However, conservation actions directed at other serpentine species may benefit Metcalf Canyon jewelflower. For example, recent acquisition of mitigation land on Coyote Ridge by the Santa Clara Valley Transportation Authority is protecting suitable habitat for Metcalf Canyon jewelflower. Livestock grazing along Coyote Ridge designed to maintain and improve habitat for the food and nectar plants of Bay checkerspot butterfly (see the account for Bay checkerspot butterfly for more information) may indirectly benefit Metcalf canyon jewelflower by reducing the density and biomass of exotic grasses and herbs that may compete with the jewelflower.

The U.S. Fish and Wildlife Service suggests that surveys should be conducted at the Tulare Hill site to see if appropriate habitat still exists for potential repopulation efforts (U.S. Fish and Wildlife Service 1998).

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

Suitable habitat for Metcalf Canyon jewelflower is defined as serpentine bunchgrass grassland and serpentine rock outcrops between 0 and 1,200 feet in elevation on slopes with all degrees of steepness. Potential ecoregion subsections include the Fremont-Livermore Hills and Valleys, Leeward Hills, Western Diablo Range, and Diablo Range.

#### Rationale

Metcalf Canyon jewelflower is restricted to serpentine rock outcrops and sparsely-vegetated serpentine grassland below 1,200 feet (U.S. Fish and Wildlife Service 1995, 1998).

## Model Results

Figure 2 shows the modeled potential habitat for Metcalf Canyon jewelflower. The habitat is primarily located in the hills east of the Santa Clara Valley floor and north of Anderson Reservoir, and in scattered areas dominated by serpentinite-derived soils in the foothills of the Santa Cruz Mountains to the west of the valley floor. All of the known occurrences are found on modeled habitat (see Figure 2; note that in some cases the modeled habitat is smaller than the size of the symbols on the map).

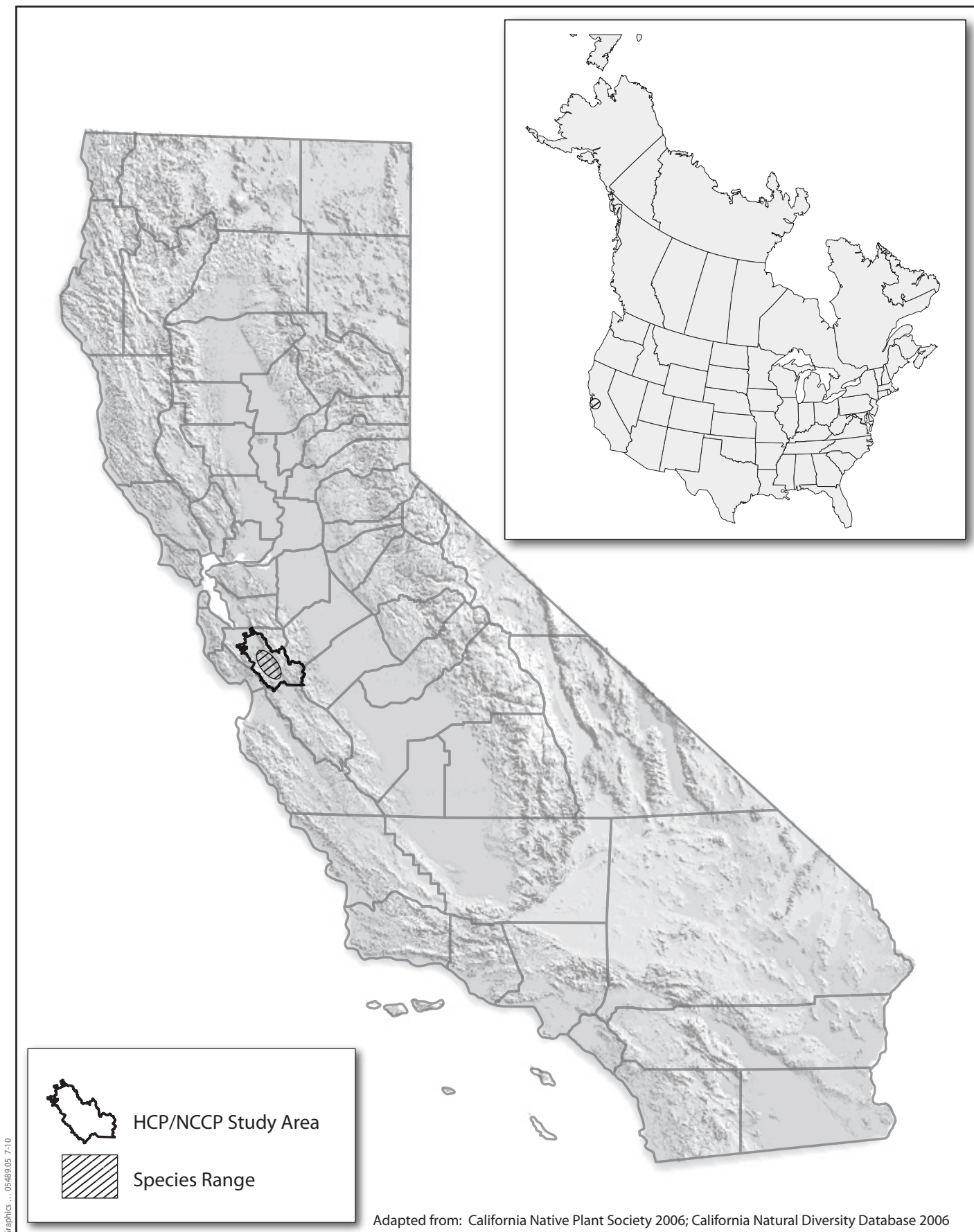
## Literature Cited

### Printed References

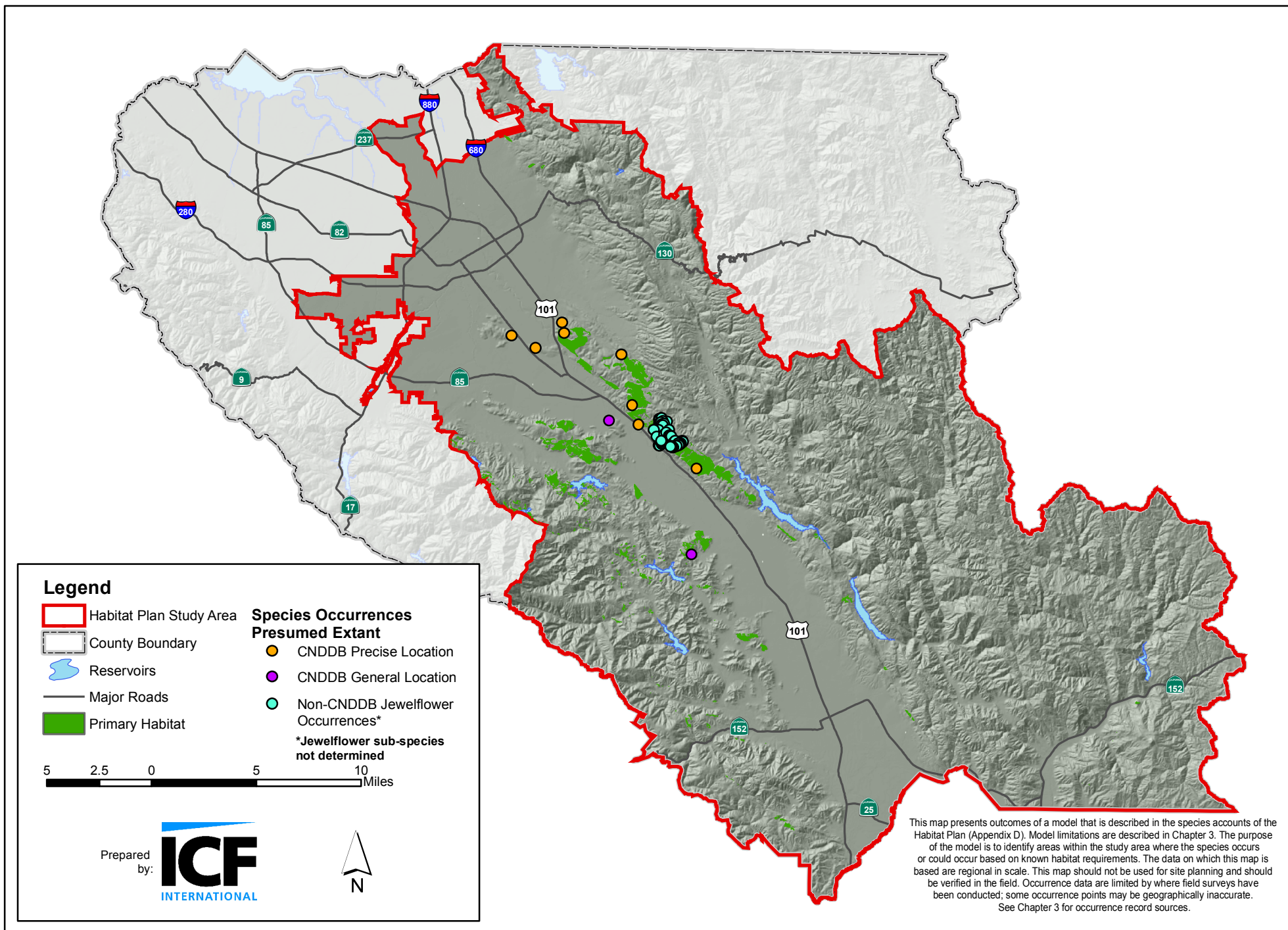
- Buck, R.E, Taylor, D.W., and Kruckeberg, A.R. 1993. *Streptanthus*. Pages 439–444 in J.C. Hickman (ed.). *The Jepson manual: higher plants of California*. Berkeley, CA: University of California Press.
- Calflora: Information on California plants for education, research and conservation. [web application]. 2006. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <<http://www.calflora.org/>>. Accessed: March 03, 2006.
- California Native Plant Society. 2006. Inventory of Rare and Endangered Plants (online edition, v7-06a). California Native Plant Society. Sacramento, CA. Available: <<http://www.cnps.org/inventory>>. Accessed: March. 3, 2006.
- California Natural Diversity Database. 2006. Occurrence Report for *Streptanthus albidus* ssp. *peramoenus*. RareFind, Version 3.0.5 (Updated March 31, 2006). Sacramento, CA: California Department of Fish and Game.
- Corelli, T. and Chandik, Z. 1995. *The Rare and Endangered Plants of San Mateo and Santa Clara County*. Monocot Press: Half Moon Bay, CA.
- Greene, E.L. 1887. Miscellaneous species new or rare. *Pittonia* 1:62.
- Greene, E.L. 1904. Certain west American Cruciferae. *Leaflets of Botanical Observation and Criticism* 1:81–90.
- Integrated Taxonomic Information System on-line database. 2001. Available: <<http://www.itis.usda.gov>>. Accessed: March 8, 2006.
- Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press: Berkeley, CA. pp. 1238.
- Kruckberg, A.R. 1958. The taxonomy of the species complex, *Streptanthus glandulosus* Hook. *Madrono* 14:217–227.

- Mayer, M.S., and P.S. Soltis. 1994. The evolution of serpentine endemics: A chloroplast DNA phylogeny of *Streptanthus glandulosus* complex (Cruciferae). *Systematic Botany* 19: 557–574.
- Mayer, M.S., P.S. Soltis, and D.E. Soltis. 1994. The evolution of the *Streptanthus glandulosus* complex (Cruciferae): Genetic divergence and gene flowing serpentine endemics. *American Journal of Botany* 81:1288–1299.
- McCarten, N.F. 1992. Community structure and habitat relations in a serpentine grassland in California. Pp. 207-211 In: A.M. Baker, J. Proctor, R.D. Reeves, editors. *The Vegetation of Ultramafic (Serpentine) Soils*. Intercept Ltd., Andover, Hampshire, UK.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.6. NatureServe, Arlington, Virginia. Available <<http://www.natureserve.org/explorer>>. Accessed: March 3, 2006.
- U.S. Fish and Wildlife Service. 1995. *Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Ten Plants and Threatened Status for Two Plants from Serpentine Habitats in the San Francisco Bay Region of California*. Federal Register [pp. 6671–6685, Friday, February 3, 1995]. Portland, Oregon.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, Oregon. 330+ pp.
- Zippin, D. 1997. Herbivory and the population biology of a rare annual plant, the bracted twistflower (*Streptanthus bracteatus*). Ph.D. Dissertation, University of Texas, Austin, TX.









**Figure 2**  
**Metcalf Canyon Jewelflower Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

## Most Beautiful Jewelflower (*Streptanthus albidus* ssp. *peramoenus*)

### Legal Status

**State:** California Native Plant Society  
List 1B.2<sup>1</sup>

**Federal:** Special Concern

**Critical Habitat:** None

**Recovery Planning:** *Recovery Plan for  
Serpentine Soil Species of the San  
Francisco Bay Area* (U.S. Fish and  
Wildlife Service 1998)



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California Academy of Sciences

### Taxonomy

Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*) was first described by Edward Greene in 1887 as *Streptanthus peramoenus* (Greene 1887). It was grouped into the subgenus *Euclisia* and changed status with the subgenus. *Euclisia* became its own genus (Greene 1904) until Jepson (1925) moved it back to subgenus status. Jepson (1925) considered most beautiful jewelflower to be a part of *S. glandulosus*. Kruckberg (1958) determined that *S. albidus* was distinct both morphologically and based on geologic restrictions that he recognized this species as separate from *S. glandulosus* and divided it into *S. albidus* ssp. *albidus* (Metcalf Canyon jewelflower, another taxa covered by this Plan) and *S. albidus* ssp. *peramoenus*.

The taxonomic status of this species is currently under debate. Recent genetic studies raise the possibility that the species concept for most beautiful jewelflower may be broadened by including additional populations of plants currently assigned to other *Streptanthus* species (Mayer et al. 1994; Mayer and Soltis 1999). However, the U.S. Fish and Wildlife Service concluded that current research affirms the uniqueness of this taxon (1998). Therefore, its regulatory status is unlikely to be affected by ongoing taxonomic research. Most beautiful jewelflower is in the mustard family (Brassicaceae).

### Description

Descriptions of the species' physical characteristics can be found in Kruckeberg (1958) and Buck et al. (1993). The species is an annual herb up to 32 inches tall with fleshy and glaucous stems and leaves. The flowers have lilac-lavender

<sup>1</sup> 1B means rare, threatened, or endangered in California and elsewhere; .2 means fairly endangered in California.

sepals and purplish petals. The subspecies is distinguished from the closely-related Metcalf Canyon jewelflower by its lilac-lavender sepals. (Metcalf Canyon jewelflower has greenish-white sepals which are tinged with purple at their base.)

## Distribution

### General

Most beautiful jewelflower is endemic to the northern South Coast Ranges of Contra Costa, Alameda, and Santa Clara Counties (Figure 1) (California Native Plant Society 2006; California Natural Diversity Database 2008). If other species of *Streptanthus* were to be incorporated into the same taxon as most beautiful jewelflower, its range would be expanded to include Mount Hamilton and portions of the Mount Hamilton range, as discussed below.

### Occurrences within the Study Area

There are 39 occurrences of the most beautiful jewelflower in the study area, 35 of which are listed with the California Natural Diversity Database (2012). The other occurrences are known to occur on Santa Clara County Parks and on or adjacent to Santa Clara Valley Water District lands. All occurrences are believed to be extant. Most are of high precision and may be accurately located. Two other occurrences are known that are not recorded in the California Natural Diversity Database; two populations of the dark-flowered form that occur on Mount Hamilton (Mayer et al. 1994; not mapped). Other collections of *Streptanthus glandulosus* from the Mount Hamilton Range (CalFlora 2006) may also represent the dark-flowered form of most beautiful jewelflower.

Occurrences of the species are located in the vicinity of Anderson Lake, Kirby Canyon, and Metcalf Canyon east of Highway 101. West of Highway 101, occurrences are documented in the New Almaden Historic Landmark District, in the vicinity of Coyote Peak and Santa Teresa County Park, in the vicinity of Calero Reservoir County Park and Laurel Hill, in the vicinity of Chesbro Reservoir, and south of Morgan Hill and north of the Carlyle Hills. These occurrences fall on both Santa Clara County land, principally in County parks, and on private land. Two of the occurrences on private land are owned by IBM (California Natural Diversity Database 2006). According to the U.S. Fish and Wildlife Service, IBM intends to preserve these occurrences (U.S. Fish and Wildlife Service 1998).

## Natural History

### Habitat Requirements

Most beautiful jewelflower is almost entirely restricted to serpentinite outcrops or soils derived from serpentinite (Table 1). Serpentine soils are deficient in calcium, but serpentine-endemic jewelflower populations are capable of growing under low levels of calcium (Kruckeberg 1954). Most beautiful jewelflower is generally found in grasslands dominated by native perennial grasses or in open grasslands dominated by nonnative annual grasses with relatively low cover. It is also found on rock outcrops or grassy openings in serpentine chaparral or where serpentine grassland or chaparral habitats transition to oak woodland and it can occur on serpentine roadcuts and road surfaces. It has been found at elevations ranging from 360 to 3280 feet.

Species commonly associated with most beautiful jewelflower include native species such as bigberry manzanita (*Arctostaphylos glauca*), buck brush (*Ceanothus cuneatus*), California poppy (*Eschscholzia californica*), dwarf plantain (*Plantago erecta*), purple needlegrass (*Stipa* [*Nasella*] *pulchra*), as well as non-natives including foxtail chess (*Bromus madritensis* ssp. *rubens*), pampas grass (*Cortaderia jubata*), slender wild oat (*Avena barbata*), soft chess (*Bromus hordeaceus*), and wild oat (*Avena fatua*) (California Natural Diversity Database 2006).

At least one population of the dark-flowered form of most beautiful jewelflower occurs on non-serpentine habitat at Henry Coe State Park (Mayer et al. 1994). A population found in Arroyo Hondo in Alameda County occurs in non-serpentine habitat, where it occurs on rock outcrops in coastal sage scrub dominated by California sagebrush (*Artemisia californica*), bush monkeyflower (*Mimulus aurantiacus*), and golden-yarrow (*Eriophyllum confertiflorum*). Bristly jewelflower (*Streptanthus glandulosus*), to which most beautiful jewelflower is closely related, also has serpentine-tolerant and serpentine-intolerant populations (Kruckeberg 1951).

**Table 1.** Habitat Associations for Most Beautiful Jewelflower

Land Cover Type	Habitat Designation	Habitat Parameters	Habitat Suitability	Rationale
Serpentine bunchgrass grassland	Primary	Shallow soils or where non-native species have low relative cover; 360 to 3280 feet	Moderate	Kruckeberg 1954
Serpentine rock outcrop/barrens	Primary	Includes roadcuts; 360 to 3280 feet	High	Competition from non-natives in serpentine grassland frequently restricts this species to shallow soils near serpentine rock outcrops (Green 2004)
Mixed serpentine chaparral	Primary	Grassy openings; 360 to 3280 feet		Kruckeberg 1954; California Natural Diversity Database 2006
Rock outcrop	Secondary	360 to 3280 feet	Low to Moderate	Non-serpentine populations of the species may be found here (Mayer et al. 1994; California Natural Diversity Database 2006)

## Population Ecology

Population sizes of most beautiful jewelflower vary from less than fifty to tens of thousands (California Natural Diversity Database 2006). Most beautiful jewelflower appears to be insect pollinated. Kruckeberg (1957) reported that members of the *Streptanthus glandulosus* complex, including most beautiful jewelflower, were incapable of self-pollination, and he had observed bees, butterflies, and beetles visiting the flowers. Bees have been observed to be the primary floral visitors in other outcrossing *Streptanthus* species (Dieringer 1991; Preston 1994), although flies and butterflies also visit *Streptanthus* flowers (Moldenke 1976). *Streptanthus* flowers appear to be self-fertile, but a combination of spatial and temporal separation of the stamens and receptive stigmas prevents self-pollination (Preston 1991).

No information on herbivory of most beautiful jewelflower is available; however, other jewelflower species are eaten by herbivorous insects (e.g., Zippin 1997). The larvae of pierid butterflies commonly eat jewelflower leaves, flowers, and developing fruit (Shapiro 1981a, 1981b, 1984; Karban and Courtney 1987; Zippin 1997). The flowers are also eaten by sap beetles and flea beetles (Shapiro 1981a; Karban and Courtney 1987; Preston 1991; Zippin 1997). Some species of serpentine-endemic jewelflowers appear to have “egg-mimics” on the leaves, which inhibit some pierid species from laying eggs there (Shapiro 1981a). Key seasonal periods for the species are shown in Table 2.

**Table 2.** Key Seasonal Periods for Most Beautiful Jewelflower

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Germination	✓	✓	✓							✓	✓	✓
Flowering			✓	✓	✓	✓						
Fruiting					✓	✓	✓					
Seed Dispersal					✓	✓	✓	✓	✓	✓	✓	✓

## Population Status and Trends

**Global:** Declining (NatureServe 2006)

**State:** Declining (NatureServe 2006)

**Study Area:** Unknown

Population trends for most beautiful jewelflower are unknown in the study area. There are no known populations in the study area that have been extirpated. Road construction through serpentine areas may create habitat for this species by exposing serpentine rock that can be colonized by most beautiful jewelflower (S. Weiss pers. comm.). However, the small number of populations known, and the known threats to these populations, suggest that protection and management of populations is necessary to ensure the species' long-term survival (U.S. Fish and Wildlife Service 1998).

## Threats

Potential threats to most beautiful jewelflower include cattle grazing, competition from invasive exotic species (notably yellow star thistle [*Centaurea solstitialis*]), and habitat loss from residential development and road construction (California Natural Diversity Database 2006; California Native Plant Society 2006). Non-native species invasion of serpentine grassland threatens occurrences in the study area (Green 2004). Grazing threatens some populations in the study area west of Highway 101 (U.S. Fish and Wildlife Service 1998). Additional threats in the study area include rooting by feral pigs and disturbance from landfill operations.

## Data Characterization

A species profile for most beautiful jewelflower is provided in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998). The main sources of general information on most beautiful jewelflower are *The Jepson Manual* (Buck et al. 1993) and the California Native Plant Society (2001). Specific information on the systematics of most beautiful jewelflower is found in Mayer et al. (1994) and in Mayer and Soltis (1999). Specific observations on habitat and plant associates, threats, and

other factors are provided in the recovery plan and in the California Natural Diversity Database (2006). There are relatively many occurrence records for this species, and all are presumed extant and with excellent or good geographic accuracy. Very little information about the reproductive biology or demography of most beautiful jewelflower is available (U.S. Fish and Wildlife Service 1998), but the species' ecology can be inferred from study of other *Streptanthus* species.

## Existing Conservation Actions in the Study Area

There are no known conservation actions in the study that are focused on most beautiful jewelflower. However, conservation actions directed at other serpentine species may benefit the species. For example, recent acquisition of mitigation land on Coyote Ridge by the Santa Clara Valley Transportation Authority is protecting suitable habitat for most beautiful jewelflower. Livestock grazing along Coyote Ridge designed to maintain and improve habitat for the food and nectar plants of Bay checkerspot butterfly (see the account for Bay checkerspot butterfly for more information) may indirectly benefit most beautiful jewelflower by reducing the density and biomass of exotic grasses and herbs that may compete with the jewelflower. Acquisition by the Santa Clara Valley Open Space Authority south of Calero Reservoir is also protecting several occurrences of this species (Cañada de Oro Open Space Preserve). Long-term plans by the Santa Clara County Parks and Recreation Department to reintroduce livestock grazing in Santa Teresa County Park may also benefit most beautiful jewelflower by reducing competition with exotic grasses and herbs.

## Modeled Habitat Distribution in Study Area

### Model Description

#### Model Assumptions

1. Primary habitat is defined as serpentine bunchgrass grassland, serpentine rock outcrops/barren, and mixed serpentine chaparral between 0 and 3,500 feet elevation on slopes with all degrees of steepness.
2. Secondary habitat is defined as non-serpentine rock outcrops between 0 and 3,500 feet elevation on slopes with all degrees of steepness.

Potential ecoregion subsections for both habitat types are the Fremont-Livermore Hills and Valleys, Santa Clara Valley, Leeward Hills, Santa Cruz Mountains, Western Diablo Range, and Diablo Range.



## Rationale

Most beautiful jewelflower is almost entirely restricted to serpentinite outcrops or soils derived from serpentinite (Kruckeberg 1954). The species is found within serpentine grasslands and serpentine chaparral, primarily in grassy openings or at the boundary with oak woodlands (U.S. Fish and Wildlife Service 1998; California Natural Diversity Database 2006). Most beautiful jewelflower is less commonly found in non-serpentine soils on rock outcrops (Mayer et al. 1994; California Natural Diversity Database 2006).

## Model Results

Modeled potential habitat for most beautiful jewelflower is shown in Figure 2. The habitat is concentrated in the hills east of the Santa Clara Valley floor and north of Anderson Reservoir, and in scattered areas dominated by serpentinite-derived soils in the foothills of the Santa Cruz Mountains to the west of the valley floor. Most of the secondary habitat is located in areas that are smaller than the minimum mapping unit of the land cover mapping, so very little of it shows on the habitat model. However, all of the known occurrences are found on modeled habitat (see Figure 2, note that in some cases the modeled habitat is smaller than the size of the symbols on the map).

## Literature Cited

### Printed References

- Buck, R.E., D.W. Taylor, and A.R. Kruckeberg. 1993. *Streptanthus*. Pages 439–444 in J.C. Hickman (ed.), *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press.
- Calflora: Information on California plants for education, research and conservation. [web application]. 2006. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <<http://www.calflora.org/>>. Accessed: March 03, 2006.
- California Native Plant Society. 2001. *Inventory of Rare and Endangered Plants of California (sixth edition)*. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. Sacramento, CA: California Native Plant Society, Sacramento, CA.
- California Native Plant Society. 2006. *Inventory of Rare and Endangered Plants* (online edition, v7-06a). California Native Plant Society. Sacramento, CA. Available: <<http://www.cnps.org/inventory>>. Accessed: March 2, 2006.



- California Natural Diversity Database. 2012. Computer Report for *Streptanthus albidus* ssp. *peramoenus*. RareFind, Version 3.0.5 (Updated April 2012). California Department of Fish and Game, Sacramento, CA.
- California Natural Diversity Database. 2008. Computer Report for *Streptanthus albidus* ssp. *peramoenus*. RareFind, Version 3.0.5 (Updated May 2008). California Department of Fish and Game, Sacramento, CA.
- California Natural Diversity Database. 2006. Computer Report for *Streptanthus albidus* ssp. *peramoenus*. RareFind, Version 3.0.5 (Updated March 31, 2006). California Department of Fish and Game, Sacramento, CA.
- Dieringer, G. 1991. Pollination Ecology of *Streptanthus bracteatus* (*Brassicaceae*): A Rare Central Texas Endemic. *Southwestern Naturalist* 36(3):341–343.
- Green, Allison R. 2004. Effects of exotic species and soil depth on a rare serpentine jewelflower. Masters Thesis. San José State University, San José, CA.
- Greene, E.L. 1887. Miscellaneous species new or rare. *Pittonia* 1:62.
- Greene, E.L. 1904. Certain west American Cruciferae. *Leaflets of Botanical Observation and Criticism* 1:81-90.
- Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press: Berkeley, CA. pp. 1238.
- Karban, R., and S. Courtney. 1987. Intraspecific Host Plant Choice: Lack of Consequences for *Streptanthus tortuosus* (*Cruciferae*) and *Euchloe hyantis* (*Lepidoptera: Pieridae*). *Oikos* 48:243–248.
- Kruckeberg, A.R. 1951. Intraspecific Variability in the Response of Certain Native Plant Species to Serpentine Soil. *American Journal of Botany* 38:408–419.
- Kruckeberg, A.R. 1954. The Ecology of Serpentine Soils. III. Plant Species in Relation to Serpentine Soils. *Ecology* 35:267–274.
- Kruckeberg, A.R. 1957. Variation in Fertility of Hybrids between Isolated Populations of the Serpentine Species, *Streptanthus glandulosus* Hook. *Evolution* 11:185–211.
- Kruckeberg, A.R. 1958. Taxonomy of the Species Complex, *Streptanthus glandulosus* Hook. *Madroño* 14:217–248.
- Mayer, M.S., and P.S. Soltis. 1999. Intraspecific Phylogeny Analysis Using ITS Sequences: Insights from Studies of the *Streptanthus glandulosus* Complex (*Cruciferae*). *Systematic Botany* 24:47–61.

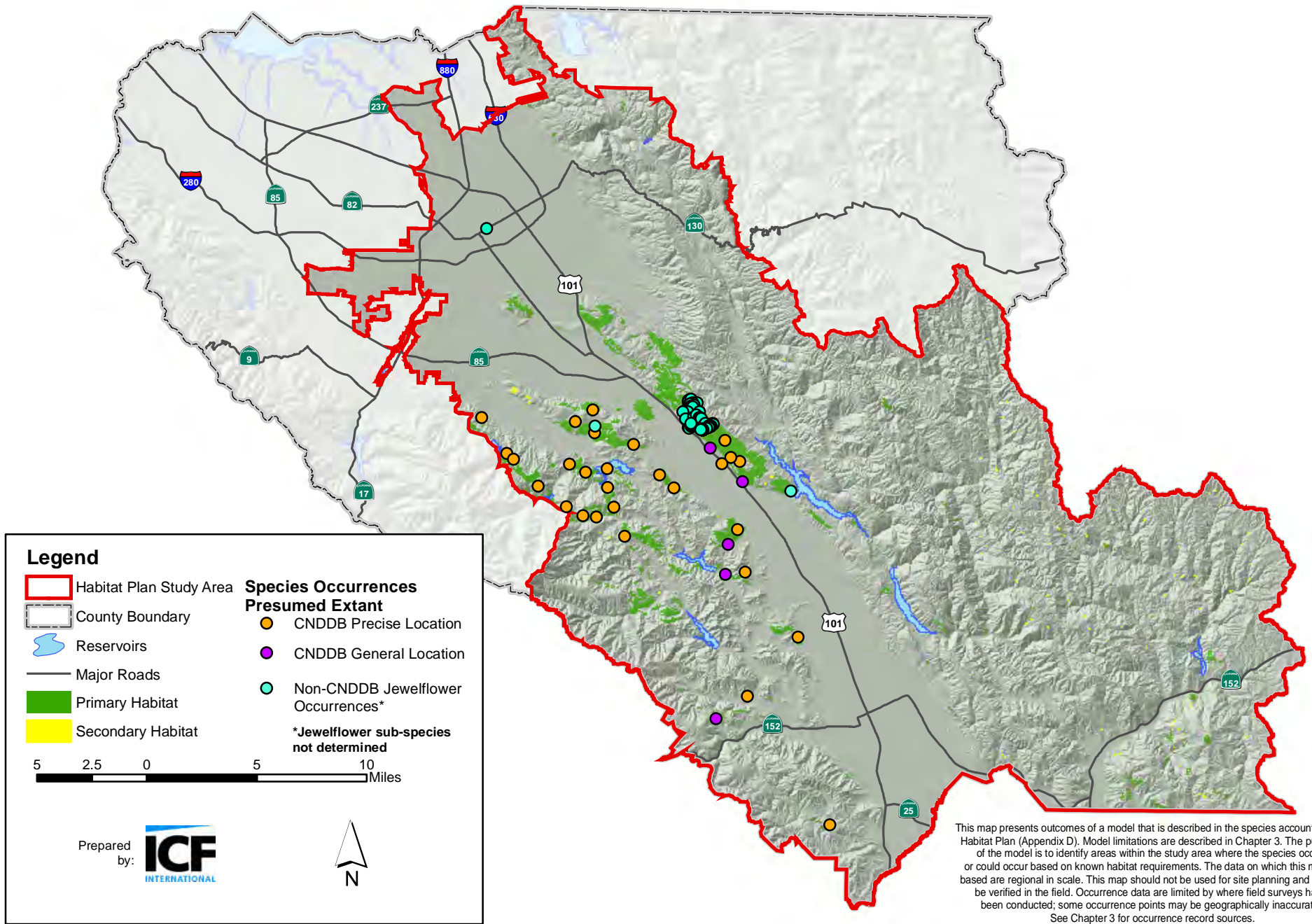
- Mayer, M.S., P.S. Soltis, and D.E. Soltis. 1994. The Evolution of the *Streptanthus glandulosus* Complex (Cruciferae): Genetic Divergence and Gene Flow in Serpentine Endemics. *American Journal of Botany* 81:1288–1299.
- Moldenke, A.R. 1976. California Pollination and Vegetation Types. *Phytologia* 42:223–282.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.6. NatureServe, Arlington, Virginia. Available: <<http://www.natureserve.org/explorer>>. Accessed: March 3, 2006.
- Preston, R.E. 1991. The Intrafloral Phenology of *Streptanthus tortuosus* (Brassicaceae). *American Journal of Botany* 78(8):1044–1053.
- Preston, R.E. 1994. Pollination Biology of *Streptanthus tortuosus* (Brassicaceae). *Madroño* 41(2):138–147.
- Shapiro, A.M. 1981a. Egg-Mimics of *Streptanthus* (Cruciferae) Deter Oviposition by *Pieris sisymbrii* (Lepidoptera: Pieridae). *Oecologia* 48:142–143.
- Shapiro, A.M. 1981b. The Pierid Fauna of Jewel Flower at a Mid-Elevation Sierran Locality. *Journal of the Lepidopterists' Society* 35(4):322–324.
- Shapiro, A.M. 1984. *Anthocharis lanceolata* (Pieridae) Feeding on a Rare Endemic *Streptanthus* Species (Cruciferae). *Journal of the Lepidopterists' Society* 38(3):251–252.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, OR. 330+ pp.
- Zippin, D. 1997. Herbivory and the population biology of a rare annual plant, the bracted twistflower (*Streptanthus bracteatus*). Ph.D. Dissertation, University of Texas, Austin, TX.

## Personal Communications

- Weiss, Stuart. 2006. Consulting Biologist. Field trip to Coyote Ridge, April.







**Figure 2**  
**Most Beautiful Jewelflower Modeled Habitat Distribution - Santa Clara Valley Habitat Plan**

Appendix E

**Estimation of Contributions to  
Deposition of Nitrogen in  
Santa Clara County for the  
Santa Clara Valley Habitat Plan**



## **Appendix E**

### **Estimation of Contributions to Deposition of Nitrogen in Santa Clara County for the Santa Clara Valley Habitat Plan**

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## Acronyms and Abbreviations

BAAQMD	Bay Area Air Quality Management District
Bay Area	San Francisco Bay Area
BCB	Bay checkerspot butterfly
CARB	California Air Resources Board
CMAQ	Community Multiscale Air Quality modeling system
CMB	chemical mass balance
CRPAQS	California Regional PM <sub>10</sub> /PM <sub>2.5</sub> Air Quality Study
CVRP	Coyote Valley Research Park
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
Habitat Plan	Santa Clara Valley Habitat Plan
HNO <sub>3</sub>	nitric acid
HONO	nitrous acid
ISCST3	Industrial Source Complex—Short Term
kg-N/ha/y	kilograms of nitrogen per hectare per year
km	kilometer
km <sup>2</sup>	square kilometers
N	nitrogen
NH <sub>4</sub> -NO <sub>3</sub>	ammonium nitrate
NCDC	National Climatic Data Center
NH <sub>3</sub>	ammonia
NO	nitrogen oxide
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	oxides of nitrogen
OPTM	Oxidant and Precursor Tagging Methodology
PAN	peroxyacetyl nitrate
PM <sub>10</sub>	particulate matter 10 microns in diameter or less
PM <sub>2.5</sub>	particulate matter 2.5 microns in diameter or less

ppb	parts per billion
PPTM	Particle and Precursor Tagging Methodology
SMOKE	Sparse Matrix Operator Kernel Emissions
SO <sub>2</sub>	sulphur dioxide
SR	State Route
TMDL	total maximum daily load
US 101	U.S. Highway 101
USFWS	U.S. Fish and Wildlife Service



Appendix E

# Nitrogen Deposition Contribution Estimates in Santa Clara County for the Santa Clara Valley Habitat Plan

## Executive Summary

Atmospheric nitrogen deposition is a complex process by which reactive chemical species of nitrogen (N)—nitrogen oxides (NO<sub>x</sub>), ammonia (NH<sub>3</sub>), and their reaction products—are deposited onto surfaces and enter ecosystems as N-fertilizer. N-deposition estimates (from varied studies) for the Santa Clara Valley range from 8–20 kilograms of nitrogen per hectare per year (kg-N/ha/y).<sup>1</sup> In Santa Clara County, N-deposition threatens serpentine grasslands that support numerous covered species, including the threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*). The added N allows nutrient-poor serpentine soils to be invaded by non-native annual grasses that displace the native forbs that provide caterpillar food and adult nectar for the butterfly. N-deposition is the largest indirect impact of urban development on the serpentine grassland ecosystem.

The effects of N-deposition on non-serpentine annual grasslands and the grassland understory of oak woodlands are similar to those on serpentine grassland—increased annual grass growth displaces native forbs. Non-serpentine annual grasslands and oak woodlands in the study are extensive (310,875 acres, or 60% of the study area<sup>2</sup>), so these adverse effects could be widespread.

For this study, ICF International (ICF) analyzed nitrogen deposition using several modeling approaches in order to estimate the sources that contribute to deposition in the study area for the Santa Clara Valley Habitat Plan (Habitat Plan). In order to estimate contributions from individual roadways and to assess the increase in deposition due to increases in traffic, Gaussian models for a limited domain were applied to receptors centered on serpentine habitat that supports populations of the threatened Bay checkerspot butterfly (called *habitat areas* in this report). Serpentine habitat receptors were selected because of the sensitivity of these areas to N-deposition. The much more complex Community Multiscale Air Quality modeling system (CMAQ) was also used to simulate the area's more complex nitrogen transport processes, and, using the Particle and

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<sup>1</sup> One hectare = 2.47 acres. 1 kg-N/ha/y = 0.93 lb-N/acre/y.

<sup>2</sup> The “study area” as referenced in this report includes State Parks lands.

Precursor Tagging Methodology (PPTM) source apportionment technique, to estimate contributors to deposition on a broader scale. The Gaussian models are relatively simple to apply but give results only within a few kilometers of the sources being modeled. The Gaussian models simulate the complex atmospheric chemistry that affects the deposition of nitrogen. The CMAQ model treats the complex transport, chemistry, and deposition processes required to simulate nitrogen deposition in detail. Because development of databases for CMAQ is a large undertaking, existing databases were acquired from the California Air Resources Board (CARB) and from the Bay Area Air Quality Management District (BAAQMD).

Estimates of overall deposition based on observations of nitrogen dioxide (NO<sub>2</sub>) concentration and modeling using CMAQ both give estimates of total nitrogen deposition of about 6 kg-N/ha/y, which is consistent with other studies such as Weiss (2006). In general, modeling estimates may be biased high or low relative to estimates made on other bases. Given modeling estimates in reasonable agreement with other methods, however, modeling methods can be used in order to compare effects of different sources in a relative sense. Modeling with CMAQ also provides estimates of increases in deposition using emissions extrapolated to future years. Modeling with Gaussian models, while not providing an estimate of overall deposition, provides an estimate of deposition from individual roadways and the increases in deposition from those roadways with emissions extrapolated to the future.

Reliable future year emissions were not available when the CMAQ modeling was conducted. Future year emissions were extrapolated from the base year based on population growth which may overestimate emissions. Based on the CMAQ modeling, total nitrogen deposition in the Bay checkerspot butterfly habitat areas could increase to 8 kg-N/ha/y in 2035 and almost 10 kg-N/ha/y in 2060 using the extrapolated emissions. Using extrapolated emissions, Gaussian modeling indicates that contributions to nitrogen deposition from major roadways could increase by almost a factor of two by 2030 and by more than a factor of 4 by 2060.

The amount that various sources contribute to deposition was assessed with different modeling approaches. The most complete of these methods was the use of the PPTM tagging approach in CMAQ. In addition, however, Gaussian modeling provided estimates of the relative contributions of several major roadways to nitrogen deposition.

In the base year, the CMAQ PPTM simulation attributes 30% of the total nitrogen deposition to mobile sources within the study area. Another 16% of the nitrogen deposition comes from stationary sources in the study area. Therefore, 46% of nitrogen deposition on the habitat areas comes from existing development and vehicle traffic generated locally within the study area. The remainder of Santa Clara County contributes 17% of the nitrogen deposition while the remaining Bay Area counties account for about 11% of the deposition. The CMAQ simulation indicates that the remaining 26% of the N-deposition comes from anthropogenic emissions in the remainder of the modeling domain

(i.e., most of the remainder of California other than Bay Area counties and a portion of Nevada), initial and boundary concentrations (i.e., effects from outside of the modeling domain), and biogenic emissions within the Bay Area counties. Impacts of nitrogen deposition from Morgan Hill and Gilroy were not explicitly identified in our modeling, but are part of the contribution referred to as the remainder of Santa Clara County. In the emissions inventory used to prepare emissions for CMAQ, municipalities are not identified separately from the county in which they are located. Estimates of emissions for Morgan Hill and Gilroy were made based on the overlap of boundaries of these cities with grid cells in the modeling domain (see Table E-15). Because grid cells resolve emissions only to areas measuring 16 square kilometers ( $\text{km}^2$ ), this is necessarily an approximation. However, based on these estimates, Gilroy emissions make up 2% of the Santa Clara County  $\text{NO}_x$  emissions, Morgan Hill emissions make up 3% of the Santa Clara County  $\text{NO}_x$  emissions, San José emissions make up 79% of the Santa Clara County  $\text{NO}_x$  emissions, and the remainder of Santa Clara County emissions make up (16%) of the county  $\text{NO}_x$  emissions. (Note that these relative amounts of emissions in Santa Clara County should not be confused with the estimates of contributions to deposition that are derived from the CMAQ model results.) It is reasonable to assume that the contribution to nitrogen deposition from Gilroy and Morgan Hill would be roughly in proportion to their emissions. Of the 17% contribution to nitrogen deposition noted for the remainder of Santa Clara County, therefore, we could expect Gilroy to make up about 1.5% (9% of 17%) and Morgan Hill to make up about 2.7% (16% of 17%).

Increases in nitrogen deposition in future years were simulated for Bay Area counties. The emissions data files used in this study were available with only grid cell-by-grid cell emissions in the part of the domain outside of the Bay Area. Because county-by-county emissions projections are not readily made for files in this format, future-year emissions extrapolations were not made for the remainder of the domain. Within the Bay Area, future emissions were extrapolated from the base year based on population growth which does not taken into account expected improvements in emission control technology for motor vehicles. The extrapolations could therefore overestimate the emissions in the future years. Contribution of mobile source emissions in the habitat area are estimated to increase by about 0.6 kg-N/ha/y in 2035 over the base year and by another 0.5 kg-N/ha/y in 2060. The San José contribution to nitrogen deposition in the habitat areas is estimated to be 38% in 2035. Gaussian modeling of major roadways near the habitats indicates an increase in nitrogen deposition of about 0.25 kg-N/ha/y in 2030 over the base year (a 4% increase in total deposition). The increase in 2060 relative to 2030 could be from 0.4 kg-N/ha/y to more than 1 kg-N/ha/y (at the Hale Avenue site) depending on location (a 7% to 17% increase in total deposition).

Only growth in emissions in Bay Area counties was considered in the CMAQ PPTM simulations because future-year emissions were not available for the remainder of the modeling domain. Estimates of future-year nitrogen deposition could be even higher if growth in the rest of the state were included. Gaussian modeling was limited to an area in the immediate vicinity of the habitats due to the limitations in scale of this type of model.

The contribution of emissions outside of the study area but within Santa Clara County are estimated to grow from 1.1 kg-N/ha/y in the base year to 1.5 kg-N/ha/y using emissions extrapolated to 2035 and 1.7 kg-N/ha/y using emissions extrapolate to 2060. The contribution of emissions from all other Bay Area counties are estimated to grow from 0.7 kg-N/ha/y in the base year to 0.9 kg-N/ha/y using emissions extrapolated to 2035 and 1.0 kg-N/ha/y extrapolated to 2060.

## Background

Urban development and rural development covered under the Habitat Plan are expected to increase air pollutant emissions due to an increase in passenger and commercial vehicle trips and other new industrial and nonindustrial sources. Emissions from these sources are known to increase airborne reactive nitrogen, of which a certain amount is converted into forms that can fall to the ground as depositional nitrogen.

It has been shown that increased nitrogen in serpentine soils can favor the growth of nonnative annual grasses over native serpentine species (Weiss 1999, 2006). These nonnative species, if left unmanaged, can overtake the native serpentine species, including dwarf plantain (*Plantago erecta*), the primary host plant for Bay checkerspot butterfly, a threatened species and a key covered species in the Habitat Plan. Nonnative plants may also compete with native plants for water, nutrients, light, and sites for germination, crowding out plants covered by the Habitat Plan (e.g., Metcalf Canyon jewelflower [*Streptanthus albidus* ssp. *albidus*], most beautiful jewelflower [*Streptanthus albidus* subsp. *peramoenus*], and fragrant fritillary [*Fritillaria liliacea*]).

The amount of available nitrogen in Santa Clara County serpentine grasslands is a function of biological uptake and generation, abiotic chemical transformation mechanisms, and transport of chemical nitrogen compounds (known as chemical “species”) into and out of the region. Nitrogen transport within the region is likely to be a function of farming and agricultural processes and atmospheric deposition from point and mobile sources. This report documents how nitrogen is transported into and within the region by atmospheric processes. A special emphasis is placed on characterizing the upwind sources of nitrogen that ultimately deposit on the serpentine grasslands in the Habitat Plan study area. Progressively more complex modeling techniques are used to estimate the amount of nitrogen deposition likely to affect serpentine grasslands in the study area.

## Purpose

The primary purpose of this report is to quantify the expected increases in nitrogen deposition in Santa Clara County as a result of the urban and rural growth covered by the Habitat Plan to:

- 1) extrapolate changes in deposition rates over time; and
- 2) estimate the percentage of nitrogen deposition in the study area that results from air pollution emissions within the Habitat Plan study area, as opposed to air pollution that is transported from other regions to the study area.

The Habitat Plan addresses growth over a 50-year period in the cities of San José, Morgan Hill, Gilroy, and unincorporated Santa Clara County within the Habitat Plan study area (519,506 acres, approximately 62% of the county; see Figure 1-2 in the Habitat Plan).

A large fraction of the vehicle trips within the study area originate outside the study area. This report also quantifies expected increases in nitrogen deposition within the study area from projected growth outside the study area. Although this outside growth is not addressed by the Habitat Plan, it contributes to the cumulative impact of nitrogen deposition on habitats and covered species within the Habitat Plan study area. Knowing the expected increases in nitrogen deposition outside the study allows us to put the impacts of the Habitat Plan covered activities into the proper context of growth in the entire region.

Another purpose of this report is to link the deposition of nitrogen from mobile and point sources to impacts on natural communities and the covered species addressed by the Habitat Plan. This report therefore provides technical background for the impact analysis in Chapter 4 of the Habitat Plan. The report also provides technical justification for the approval of new local fees on public and private development to help fund the Habitat Plan.

## Summary of Past Analyses

Three recent quantitative assessments of anticipated nitrogen deposition on serpentine grassland in Santa Clara County have been conducted for local projects (CH2M Hill 2000; U.S. Fish and Wildlife Service 2001; City of San José 2007). These assessments used relatively rudimentary techniques for estimating nitrogen deposition that were appropriate for each project. These methods could not be used in our study because of the complexity (e.g., many mobile sources) and large area over which the covered activities in the Habitat Plan occur. Because of the time scale involved (50 years), the Habitat Plan also needs to put the nitrogen deposition impacts of its covered activities into the context of impacts that will occur outside the study area, something these projects did not assess. These past analyses are briefly described below for context.

### Metcalfe Energy Center

The Metcalfe Energy Center is a 600 MW natural gas-fired power plant built by the Calpine Corporation at the north end of Coyote Valley, adjacent to Tulare Hill, in the City of San José. The site is located on approximately 20 acres.



Construction of the plant and its associated transmission line, gas line, and water and wastewater lines began in 2002. The plant began operating in 2005.

Modeling of nitrogen deposition from the Metcalf Energy Center used the U.S. Environmental Protection Agency's (EPA) Industrial Source Complex—Short Term (ISCST3) model. The ISCST3 model was widely used at the time of the analysis. ISCST3 model does not account for the partitioning of nitrogen into gas phase versus aerosol species (Davis et al. 2003) which limits the applicability of the modeling results to determine relationships between nitrogen emissions and nitrogen deposition in Santa Clara County. Consequently, the Metcalf Energy Center model arrived at theoretically maximum nitrogen deposition levels by assuming complete and immediate conversion of nitrogen emissions to depositional nitrogen, overestimating the deposition of nitrogen from Metcalf Energy Center on adjacent serpentine grasslands, and underestimating the fraction of NO<sub>x</sub> emissions that would be deposited in other locations, including nonserpentine areas in the Central Valley (CH2MHill 2000; Don Ballanti pers. comm.; Edith Allen pers. comm.). Because this facility was a stationary source of emissions, its model was not appropriate for the analysis used in this report.

## Coyote Valley Research Park

The Coyote Valley Research Park is approximately 385 acres and is located in the North Coyote Valley, in the southern end of San José. The Coyote Valley Research Park is located immediately southwest of the Metcalf Energy Center. Development permits are currently in place to build out over six million square feet of office space.

The U.S. Fish and Wildlife Service (USFWS) quantitatively analyzed impacts of nitrogen deposition associated with the Coyote Valley Research Park (U.S. Fish and Wildlife Service 2001) based on the nitrogen deposition analysis conducted for the Metcalf Energy Center analysis described above. Based on this extrapolation, USFWS outlined a proposed quantitative regional impact analysis methodology (Nagano pers. comm.). As part of the analysis, USFWS made the following assumptions.

- **Extrapolation from power plant (Metcalf Energy Center) emissions to emissions from development is appropriate.** The USFWS method entails comparing NO<sub>x</sub> emissions from the CVRP with NO<sub>x</sub> emissions from the Metcalf Energy Center, and quantifying acreage affected on the basis of the comparison. Accordingly, if the CVRP were expected to emit twice as much NO<sub>x</sub> as the Metcalf Energy Center, twice the area of serpentine grassland affected by Metcalf Energy Center would be affected by the CVRP.
- **The modeling approach used for Metcalf Energy Center emissions is appropriate for current analyses.** The USFWS model assumes that all of the assumptions applied for the Metcalf Energy Center are also appropriate for application to the Coyote Valley Research Park, except as noted below.

- **Ammonia emissions from the Metcalf Energy Center can be excluded from the calculation of overall Metcalf Energy Center emissions in considering the relative contribution of development to nitrogen deposition.** In comparing expected emissions from the CVRP and the Metcalf Energy Center, USFWS did not include expected  $\text{NH}_3$  emissions.
- **A multiplier of two (2) applied to the expected CVRP emissions (as described in the first bullet above) can be used to account for local and regional contributions to nitrogen deposition.** Emissions from CVRP are expected to be relatively greater than emissions from the Metcalf Energy Center project due to contributions to nitrogen deposition from local development projects and regional use of U.S. Highway 101 (US 101). In making this comparison, the nitrogen emissions expected from the CVRP development were multiplied by 2 to account for regional use of US 101 and additional projects occurring in the region.
- **The same impact level should be applied to all critical habitat units in the county, regardless of location and habitat quality.** The USFWS analysis method assumed an equal distribution of impacts on some of the critical habitat in the county and did not account for likely differences in impacts based on location of critical habitat. For example, the Santa Teresa Hills are located west of US 101, and would therefore be expected to receive lower levels of nitrogen from increased traffic than Coyote Ridge (Kirby/Andersen critical habitat unit), as noted in the USFWS 2001 BCB critical habitat designation (66 FR 83, 21450).

In summary, the USFWS biological opinion quantifies the acreage of serpentine grassland expected to be affected by nitrogen deposition due to development of the CVRP by extrapolating from estimated impacts of the Metcalf Energy Center. The USFWS method compares extrapolated  $\text{NO}_x$  emissions from the CVRP (based on extrapolation of Metcalf Energy Center emissions) with  $\text{NO}_x$  emissions from the Metcalf Energy Center, and quantifying acreage affected on the basis of the comparison. In making this comparison, the nitrogen emissions expected from the CVRP development were multiplied by 2 to account for regional use of US 101 and additional projects occurring in the region.

USFWS quantified impacts from the CVRP on nearby Bay checkerspot butterfly (BCB) critical habitat units<sup>3</sup> (Kirby/Anderson, Santa Teresa, Morgan Hill, Kalana, and Tulare) but did not discuss impacts on other Bay checkerspot butterfly critical habitat in Santa Clara County.

## Coyote Valley Specific Plan

During development of the *Coyote Valley Specific Plan Draft Environmental Impact Report*, the City of San José was required to develop a quantitative assessment of nitrogen deposition impacts related to development of Coyote Valley. The methods and assumptions used in this analysis were based on the

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<sup>3</sup> Bay checkerspot butterfly critical habitat units are serpentine grassland areas.

Metcalf Energy Center and Coyote Valley Research Park analyses described above. In this analysis, the impacts of nitrogen emissions associated with the Coyote Valley Specific Plan were estimated by comparing extrapolated nitrogen emissions from the Coyote Valley Specific Plan Area with the nitrogen emissions from Coyote Valley Research Park and then scaling the Coyote Valley Specific Plan emissions accordingly. A similar analysis was prepared to analyze potential impacts to serpentine grasslands due to increased nitrogen emissions from the Coyote Valley Specific Plan Area (City of San José 2007).

Only the three analyses described above have attempted to quantify impacts of nitrogen deposition on serpentine land covers in Santa Clara County. Of these three, only the Metcalf Energy Center analysis was an original analysis (i.e., was not extrapolated from pre-existing analyses). As described above, the Metcalf Energy Center analysis likely overestimated impacts from that project. Furthermore, newer models have since been developed and are replacing the ISCST3 model used in the Metcalf Energy Center analysis. Finally, the type and extent of impacts associated with the covered activities proposed in the Santa Clara Valley Habitat Plan are very different than those activities for which the Metcalf Energy Center Analysis was conducted. Therefore, an entirely new approach and analysis is needed to assess the nitrogen deposition impacts associated with implementing the covered activities of the Santa Clara Valley Habitat Plan.

## Background on Modeling Methods Considered for this Study

The goal of this study is to make quantitative estimates of nitrogen deposition to the Bay checkerspot butterfly habitat using established modeling techniques. There are several different techniques available to make such estimates. In the sections below we first give general descriptions of available techniques and then give a description of the techniques chosen for this study.

## Review of Common Air Quality Modeling Techniques and Nomenclature

In air quality literature, *source apportionment* refers to the process of determining the upwind source of pollutants in an air sample. Typically, one categorizes the methodology of source apportionment as either “receptor based” or “source based.”

In a receptor-based analysis, one uses an air quality sample obtained at the location of interest and back-calculates the upwind source using a statistical model such as a chemical mass balance (CMB) model. The CMB model is relatively easy to apply because it has a low computation burden and does not require information about meteorological conditions or emissions inventories.

CMB calculations have been carried out in numerous studies around the world. Limitations of CMB include the need for a relatively high amount of detail in data used in the analysis (including, for instance, measurements of a broad spectrum of hydrocarbon species). In order to differentiate sources, CMB modeling also requires that the sources have identifiable differences in speciation profiles. It is difficult, for instance, to ascertain through CMB modeling if impacts come from a particular region.

Source-based models use spatially and temporally variable emission rate information—combined with modeling of atmospheric transport, chemical transformations, and deposition processes—to determine the concentration and deposition of pollutant in a study domain. Source-based approaches require significantly more input data and modeling resources in comparison to receptor-based models. Examples of source-based models are Gaussian models, such as the CALINE series of roadway transport models and the EPA’s ISCST3 and AERMOD models (AERMOD is being phased in to replace the ISCST3 model), and Eulerian grid models, such as EPA’s Community Multiscale Air Quality modeling system (CMAQ).

One goal of this study is to determine the amount of nitrogen deposition that comes from new and existing transportation sources within the study area as compared to sources further upwind, outside the study area. Because the pollution profile of nearby and distant roadway emissions will likely be indistinguishable from a CMB modeling perspective, it is unlikely that a receptor-based methodology can determine the exact source of nitrogen transport to serpentine grasslands. Consequently, a source-based model was used for nitrogen source apportionment to the serpentine grasslands in the study area.

When adequate input data are available, the CMAQ model is likely to provide the most accurate characterization of atmospheric transport in the region because it allows for non-uniform atmospheric conditions and multiphase chemical transformations. However, complex models such as the CMAQ model require extensive data that are sometimes difficult to prepare. Improper preparation of data can result in the simulation being overly sensitive to initial and boundary conditions or other modeling complications. For instance, if winds are not accurately represented in the CMAQ input fields, inaccurate transport and deposition fields could be simulated. Furthermore, depending on the location of the domain boundaries and the size of the modeling domain, boundary conditions can dominate study results, making it difficult to interpret the simulated nitrogen deposition patterns. For a study such as this one, it is desirable to have existing meteorological and emissions databases available in order to avoid having to invest in developing and evaluating these data.

Gaussian models such as the CALINE series of models and ISC and AERMOD are much simpler than the CMAQ model. However, these models do not account for the complex chemical transformations and transport processes in the atmosphere. Gaussian models perform best when the meteorological site used to supply input data for the model is in close proximity to the sources and receptors of interest. Unfortunately, routinely available meteorological data are not always

ideally located for all studies. In this study, the sites used to supply meteorological data were located up to 50 kilometers (km) from the sources and receptor areas considered. Although not ideal, this relative spacing between meteorological sites and study area is typical of most studies using Gaussian models.

The spatial scale appropriate for application of the Gaussian models versus that for the Eulerian models is quite different. The formulations of Gaussian models are valid up to a few km from the sources simulated. The formulation used in Eulerian models was developed for horizontal grid spacing ranging from a couple of kilometers up to much larger spacing. Practically speaking, developed databases for Eulerian models with resolution finer than about 4 km are rarely available.

The modeling techniques considered for this study share the following in their methodology. Air concentrations of nitrogen species are calculated by the models. Deposition is calculated using a deposition velocity expressed in units of meters per second (m/second), such that the deposited mass can be calculated using the following equation:

$$D = C * V_d * t$$

where  $D$  is the deposited mass in  $\mu\text{g}/\text{m}^2$ ,  $C$  is concentration in  $\mu\text{g}/\text{m}^3$ ,  $V_d$  is deposition velocity in m/second,  $t$  is the time interval considered in seconds. The units employed for the various quantities in this equation may vary among the models (and therefore could require the inclusion of conversion factors), but this basic calculation is made in the case of all the models considered here.

## Air Quality Modeling Approaches Employed in this Study

For this study, ICF analyzed nitrogen deposition using several modeling approaches. One of the principal goals of the project is to estimate the sources that contribute to deposition in the habitat areas. In order to estimate contributions from individual roadways and to assess the increase in deposition due to increases in traffic, Gaussian models for a limited domain were applied around the habitats. The much more complex CMAQ model was also used to simulate the area's more complex nitrogen transport processes, and, using the PPTM source apportionment technique, to estimate contributors to deposition on a broader scale. Meteorological data for the Gaussian models are readily available. Gaussian models are commonly used to characterize overall air quality transport trends, but because they are very simplified, results from Gaussian models are best taken in context with more comprehensive modeling techniques such as the CMAQ model. For instance, a Gaussian model requires that the wind field is uniform speed at all elevations and across the entire area of interest.

In this application, meteorological data for several recent years were used in the Gaussian model simulations. On the other hand, treating all of the various area,

mobile, and point source emissions (regional and local), is difficult in the Gaussian models. Gaussian models were used to investigate the impacts of local roadways on the habitat areas, but characterizing the overall deposition was not attempted with these models given the simplicity of the models and their inability to capture certain transport and fate processes.

Due to the development time required to prepare the various meteorological and emissions inputs required for CMAQ modeling, we were constrained in this project to use existing modeling databases for CMAQ. Therefore existing CMAQ modeling databases from the California Air Resources Board (CARB) and the Bay Area Air Quality Management District (BAAQMD) were used as the starting point for modeling. The modeling databases available used a 4-km-square grid resolution for the modeling region and are populated with data from a winter episode period. Annual simulations available from CARB use 12-km resolution, which is not adequate to resolve the areas of interest around the target habitats. The areas of interest in this study are the serpentine bunchgrass grasslands shown in Figure E-8.

## Background on Future Emissions Estimates

Emissions for the base year Gaussian modeling were based on traffic counts for highways and roads in 2005, as described below in more detail. For CMAQ modeling, base year emissions were acquired from BAAQMD. At the time the modeling was conducted, however, no future year emissions projections were available. In the sections below, we include extrapolations of emissions to future years based on projected growth in the Bay Area. Over the time period for which emissions projections are now (as of 2011) available, NO<sub>x</sub> emissions are expected to decrease in the Bay Area. NO<sub>x</sub> emissions in the Bay Area, dominated by on-road mobile emissions in 1990, are expected to be dominated by non-road mobile sources by 2025 (Bay Area Air Quality Management District 2011). Given the current trends, further reductions in NO<sub>x</sub> emissions from turnover in the on-road mobile fleet will be smaller than in the past since NO<sub>x</sub> emissions from this sector will already be small by 2025. Note that from 2022 to 2025, Bay Area NO<sub>x</sub> emissions are projected to increase slightly over 2021 levels (Bay Area Air Quality Management District 2011).

Looking beyond the available projections to the years 2030 and 2060, emissions in the Bay Area would not be expected to continue to increase. Some additional benefit will be seen from fleet turnover, and additional regulation will likely curb growth in other areas. However, in order to assess the potential for impact on the habitat should emissions continue to grow, we have included deposition estimates in the sections below based on extrapolation of emissions. In all likelihood, these deposition estimates overestimate impacts, but show that increases in NO<sub>x</sub> emissions lead to roughly proportional increases in deposition to habitat areas.

## Gaussian Modeling

Gaussian modeling provides relatively high spatial resolution modeling that can estimate impacts from individual roadways or point sources. In contrast with Eulerian grid models such as CMAQ (see following section), which resolve spatial features down to about a 4-km scale, Gaussian models are applicable within a few km of the simulated sources and can differentiate receptors located only a few meters apart. For this study, Gaussian modeling was used to simulate the deposition from some major roadways that are located near the target habitat and to estimate future increases in deposition from these roadways.

Because of its limited spatial range, Gaussian modeling is not well suited to characterizing the effects of sources outside of the limited area considered in this study. Hence, observations of  $\text{NO}_x$  concentrations were used to estimate the overall amount of ambient  $\text{NO}_x$  and the overall contribution to deposition. Vehicular sources of  $\text{NH}_3$  were not considered in the Gaussian modeling but will be discussed later.

In this section the sources of data used as input to the Gaussian modeling are described, chemical conversion processes affecting the deposition of nitrogen emissions are discussed, the specifics of the setup for the Gaussian modeling are described, and estimates of nitrogen deposition based on the Gaussian modeling are provided.

## Meteorological Data

Gaussian modeling requires meteorological data to specify local temperature, wind speed, wind direction, and relative humidity. Upper air sounding data are also needed to characterize atmospheric mixing. For this application, surface meteorological data were acquired from the National Climatic Data Center (NCDC) for the surface site at the San José Airport. The upper air data were acquired from NCDC for the Oakland sounding. Both sets of data were acquired for the years 2005, 2006, and 2007.

Data were prepared for input to CAL3QHCR using the RAMMET preprocessor. For AERMOD simulations, the data were prepared using the AERMET processor.

## Atmospheric Chemistry of Nitrogen

A complete treatment of nitrogen deposition must include all the various compounds in which nitrogen appears in the atmosphere. These compounds are treated in detail in models such as CMAQ, but Gaussian models treat only the directly emitted compound, perhaps including a single transformation or decay reaction. In order to support our discussion below of compounds to be considered in the Gaussian modeling, we present a highly abbreviated discussion of the

atmospheric chemistry of nitrogen. For further detail, the reader can refer to any of a number of available textbooks treating the atmospheric chemistry of smog formation.

Compounds of concern emitted from anthropogenic sources, either mobile or stationary, are primarily NO and NO<sub>2</sub>, collectively referred to as NO<sub>x</sub>. The composition of NO<sub>x</sub> emissions is generally 90%–95% NO, with the remainder being NO<sub>2</sub>. Chemical processes in the atmosphere, particularly the reaction of NO with ozone, rapidly convert the NO to NO<sub>2</sub>. The effects of atmospheric chemistry do not end here, however, as the action of hydrocarbons and short-lived species called radicals continue to convert the NO<sub>2</sub> to a variety of additional compounds that have very different properties from the original NO<sub>x</sub> emissions.

Among others, these compounds include nitrous acid (HONO), nitric acid (HNO<sub>3</sub>), peroxyacetyl nitrate (PAN), and organic nitrates. Nitric acid will further react with NH<sub>3</sub> in the atmosphere to form ammonium nitrate (NH<sub>4</sub>-NO<sub>3</sub>). When examining the fate of emitted nitrogen (as we are in estimating nitrogen deposition), we must also consider the fate of these derivative compounds. After some hours or days of the action of atmospheric chemistry, what remains of the emitted NO<sub>x</sub> will be primarily in the form of NO<sub>2</sub>. A significant amount of nitrogen mass may also appear in the form of the derivative compounds above. The discussions below consider ways in which we might be able to augment the Gaussian modeling of NO<sub>2</sub> to include the effects of these other compounds on nitrogen deposition.

## Background Levels of NO<sub>x</sub>

In order to estimate the fraction of deposition due to a particular source, some estimate of the overall concentrations (and, hence, deposition) is necessary. Because the Gaussian modeling is not well suited to estimating the overall concentrations, we look to monitoring data to make this estimate. The EPA archives data from monitors around the country in order to assess trends in pollutant concentrations. Hence, we refer to these as “trends monitors.” Trends monitors in San José show ambient NO<sub>x</sub> at around 20 parts per billion (ppb) over the past several years, so this value was used as the background NO<sub>x</sub> concentration. Because this is an aged air mass, it was assumed this is primarily NO<sub>2</sub>. In addition to NO<sub>2</sub>, there will also be some other nitrogen compounds present in the atmosphere. Monitoring of the makeup of nitrogen compounds in the atmosphere has been undertaken for several sites in southern California (Buhr et al. 2005). At the more urban sites reported in the Buhr study (Fresno and Bakersfield), the nitrogen appears mostly as NO<sub>x</sub> (nitrogen oxide [NO] and NO<sub>2</sub>). Contribution from PAN is quite small. The contribution from nitrate is not insignificant, however. For the Fresno site, nitrate accounts for about 10% of the nitrogen. At Bakersfield, the nitrate is a little higher at about 20% of the total nitrogen.

In order to make estimates of overall nitrogen deposition (independent of the Gaussian modeling), a concentration of 20 ppb of NO<sub>2</sub> was used and a factor of



0.15 times the  $\text{NO}_2$  was used as nitrate concentration. (See <http://www.arb.ca.gov/adam/> and <http://www.epa.gov/airtrends/nitrogen.html>, data for San José Jackson Street site, 2005.) These figures are based on a review of monitoring data in the South Bay. Nitrate derives from nitric acid, and for ambient air (an aged air mass), it was assumed the nitric acid would all appear as particulate nitrate.

## Conversion of $\text{NO}_x$ to Nitric Acid

The primary focus of this study is deposition of nitrogen. Although most emissions are initially introduced into the atmosphere as  $\text{NO}$  and  $\text{NO}_2$ , chemical processes in the atmosphere rapidly convert these emissions to other forms. Nitric acid is of particular concern among these conversion products because it deposits much more rapidly than the emitted species. Gaussian models do not treat the products of atmospheric chemistry, so in this section we consider how much of the emitted  $\text{NO}_x$  might be converted to nitric acid and how that might affect the Gaussian model estimates of nitrogen deposition.

Treating the emissions as inert  $\text{NO}_2$  would likely underestimate the near source deposition because the deposition velocity for the emitted species is low. Therefore, the amount of emitted  $\text{NO}_x$  converted to nitric acid was estimated using box model simulations. Box model simulations treat an individual parcel of air, calculating chemical transformations and diurnal variations in temperature and solar radiation. Mixing with surrounding air is not included, and, for our purposes, emissions are limited to the initiation of the simulations. These box model simulations made it possible to make an alternate calculation of nitrogen deposition assuming that some fraction of the emissions were converted to nitric acid.

Box model runs were made with the Ozone Isopleth Plotting Package (Revised) OZIPR model (Gery and Crouse), using the SAPRC97 chemical mechanism. The model was configured as a box model by maintaining a constant mixing height throughout the simulation. No deposition was simulated. The location, which allows the model to calculate the solar radiation intensity, was set to the latitude and longitude of San José.

Four different sets of meteorological conditions were used representing the four seasons: winter—January 15, 2005; spring—April 15, 2005; summer—July 15, 2005; fall—October 15, 2005. The meteorological differences include the ambient temperature, relative humidity, and amount of solar radiation (calculated by OZIPR based on the location and the date). (Since these OZIPR simulations are used only to obtain a rough estimate of the conversion rate to nitric acid, an exhaustive characterization of meteorology was not made for the OZIPR simulations. Although the data for temperature and humidity collected from these dates is not necessarily typical of the entire season in which they were collected, the solar radiation calculated for these mid-season dates is representative of the unattenuated seasonal values. This limitation on the detail in the meteorology does not apply to the Gaussian model simulations discussed later which used

hourly meteorology. More complete treatment of chemical effects is included in the CMAQ model simulations that are discussed later in this report.)

As expected, the rate at which  $\text{NO}_x$  is converted to nitric acid is strongly dependent on the amount of hydrocarbon and  $\text{NO}_x$  in the system. The choice of ambient levels of hydrocarbon and  $\text{NO}_x$  is therefore very important. The emissions from an individual source cannot be considered without regard to background because the rate of conversion is determined by the overall hydrocarbon and  $\text{NO}_x$  in the atmosphere near the source.

Based on annual average NMHC concentrations at the San José central monitor operated by BAAQMD (the only monitor available in the area) for the years available (2006 onward) and adjusted downward to account for non-reactive fraction, initial volatile organic compound levels for this study were set to 80 parts per billion of carbon. Trends monitors in San José show ambient  $\text{NO}_x$  at around 20 ppb over the past several years, so this was selected as the initial  $\text{NO}_x$ .

Figures E-1 through E-4 below show the fraction of the initial  $\text{NO}_x$  converted to  $\text{HNO}_3$  as a function of distance from the starting point. Each of the lines on each chart represents a different hour of the day, and each line is identified by the time in 2400 hour military time (e.g., 800, 8 AM; 1400, 2 PM). ( $\text{NO}_x$  is also converted to other species such as PAN and HONO (nitrous acid), but these are relatively small contributors to total mass of nitrogen.) The percent  $\text{HNO}_3$  is expressed as a function of distance from the source by using a wind speed of 3.7 km/hour. The lowest wind speed (other than calm) reported in each of the three years (2005, 2006, and 2007) of met data used in the Gaussian modeling is 3.6 km/hour. A wind speed of 3.7 km/hour is therefore a small but reasonable value of the wind speed. The choice of this wind speed in one sense make this a “worst case” analysis because the low wind speed allows more of the  $\text{NO}_x$  to be converted to nitric acid within the range of the habitat area. Lower wind speeds are, of course, possible though and are reported in our data files as calm. The choice of a wind speed for this calculation that is lower than the smallest value in the data would be difficult to justify, though, since it cannot be verified based on routinely available observations.

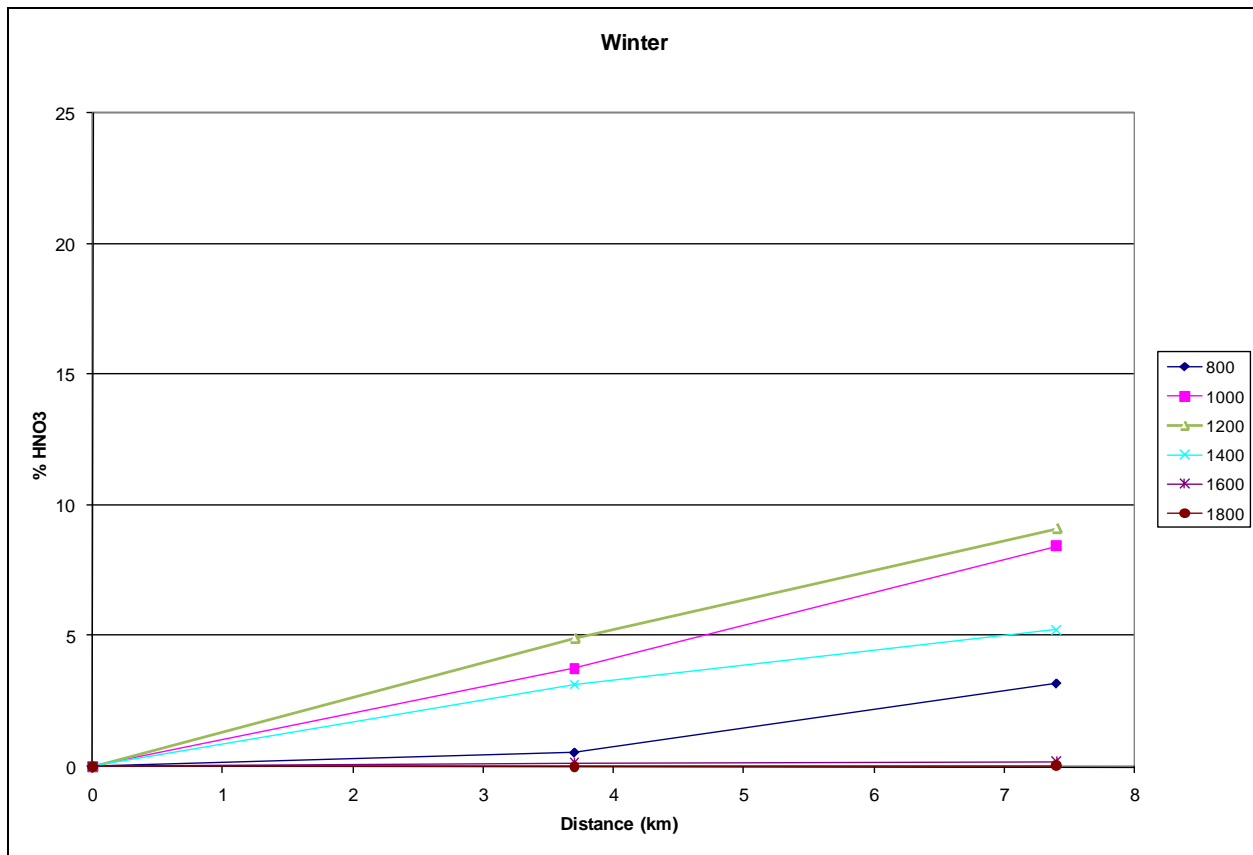
The figures extend to 8 km because the largest segment of Bay checkerspot butterfly habitat is roughly in the range of 0 to 8 km from US 101 and this range roughly matches the domain used in the Gaussian modeling. Using a higher wind speed would result in less conversion to nitric acid within this distance while a lower wind speed (e.g., calm conditions) would result in greater conversion in this range.

Simulations were started at several different times of day, as indicated on the legend for the charts. Midday start times in summer result in almost 25% of the initial  $\text{NO}_x$  being converted to nitric acid within 8 km of the source. There is a strong seasonal variation, the result of reduced solar radiation and lower temperatures in the winter.

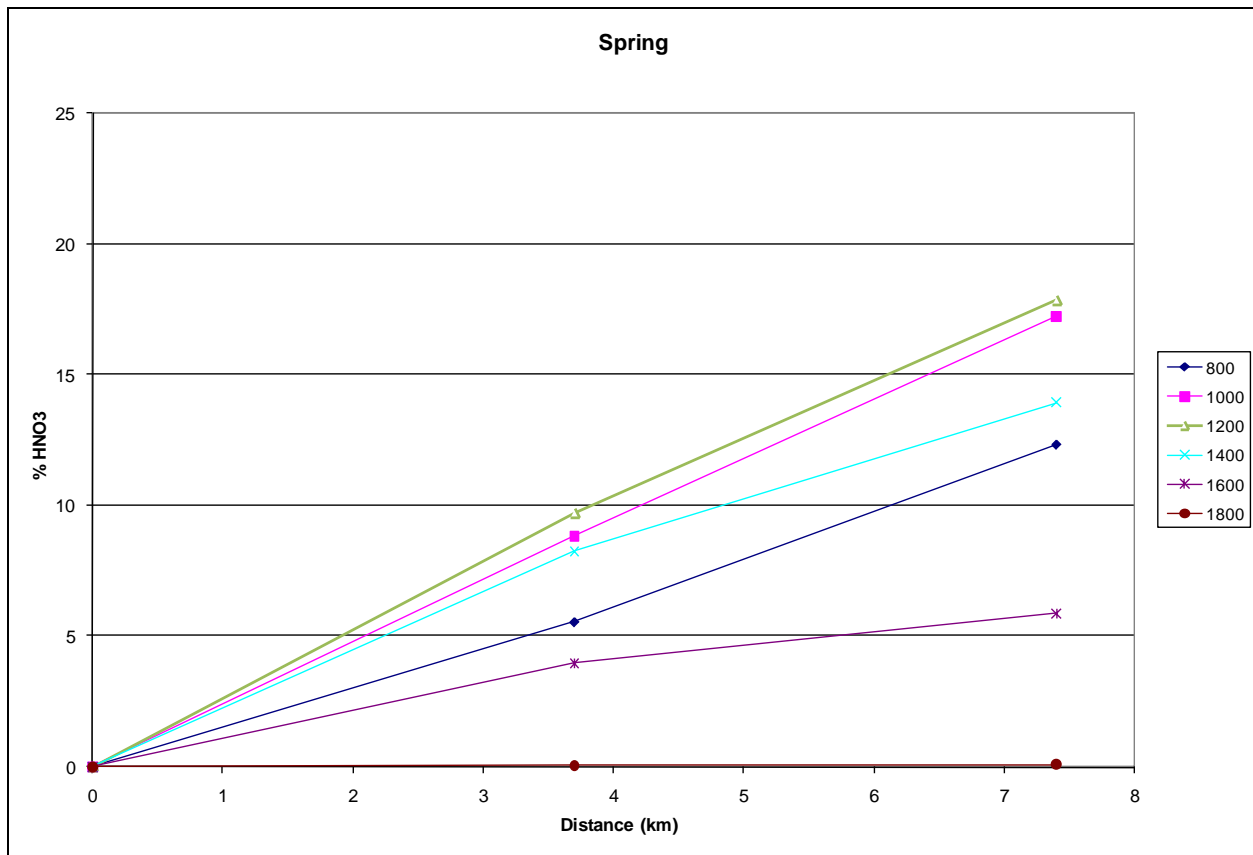
In addition to the results in the displays, simulations were also run at several different initial  $\text{NO}_x$  levels. For comparable conditions, the percentage of  $\text{NO}_x$  that was converted to  $\text{HNO}_3$  ranged from over 30% for an initial  $\text{NO}_x$  of 5 ppb to only about 7% for an initial  $\text{NO}_x$  of 60 ppb. Hence, there is a great deal of uncertainty regarding how much  $\text{NO}_x$  would be converted to nitric acid at any distance from a source.

Given the amount of  $\text{NO}_x$  that might be converted to nitric acid within a relatively short distance from the source, it is important to make some attempt to estimate how much deposition might be enhanced by considering the nitric acid concentrations. Considering the amount of uncertainty in these estimates and the need to keep the treatment simple for compatibility with the Gaussian model output, there will be uncertainties inherent in any treatment selected. Estimated nitric acid for daylight hours was based on a linear function of distance from the source. In each of the charts, the line for 1400 hours represents a roughly middle-of-the-road case, representing neither the highest percentage of nitric acid nor the lowest percentage of nitric acid. For each season, therefore, the linear function that was used to calculate the fraction of nitric acid was the percent conversion curve for 1400 hours.

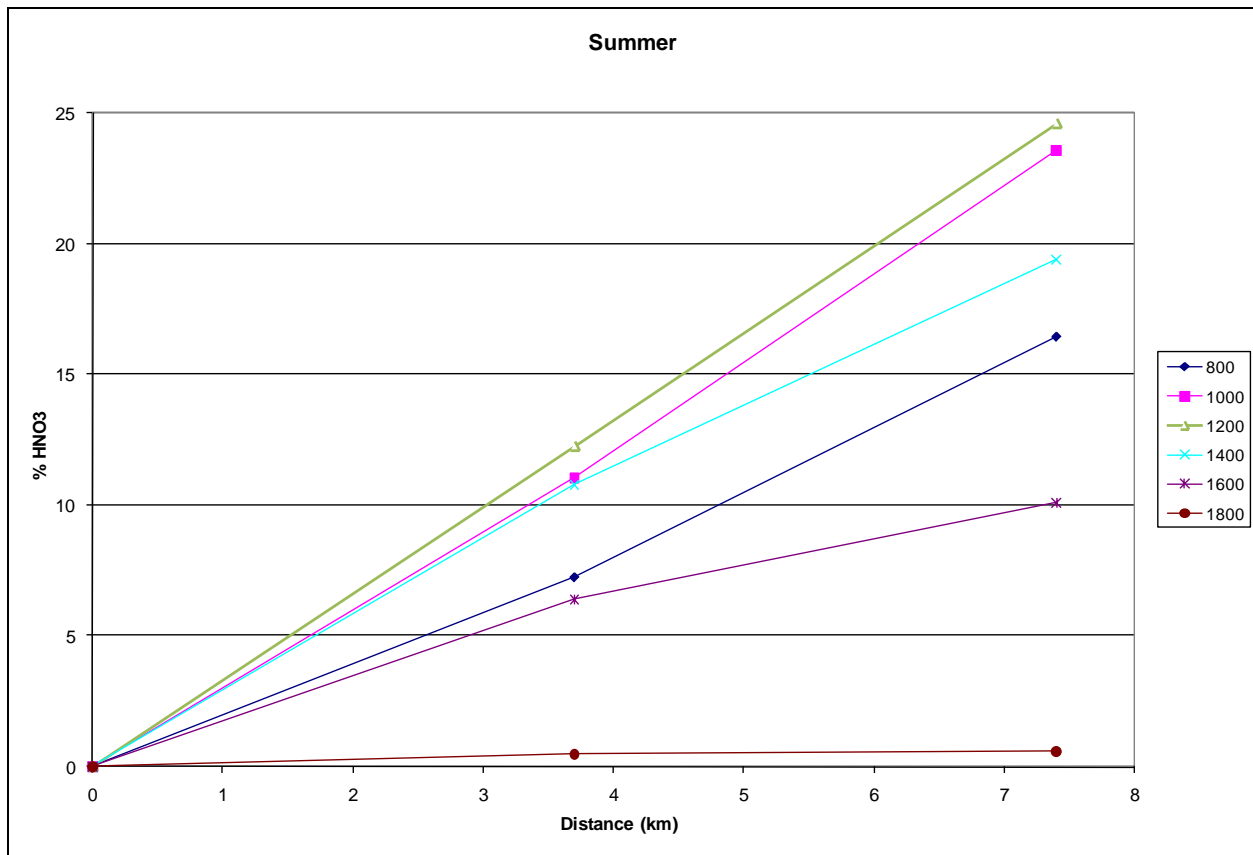
**Figure E-1.** Conversion of  $\text{NO}_x$  to Nitric Acid as a Function of Distance from Source Using Meteorological Parameters Representative of Winter



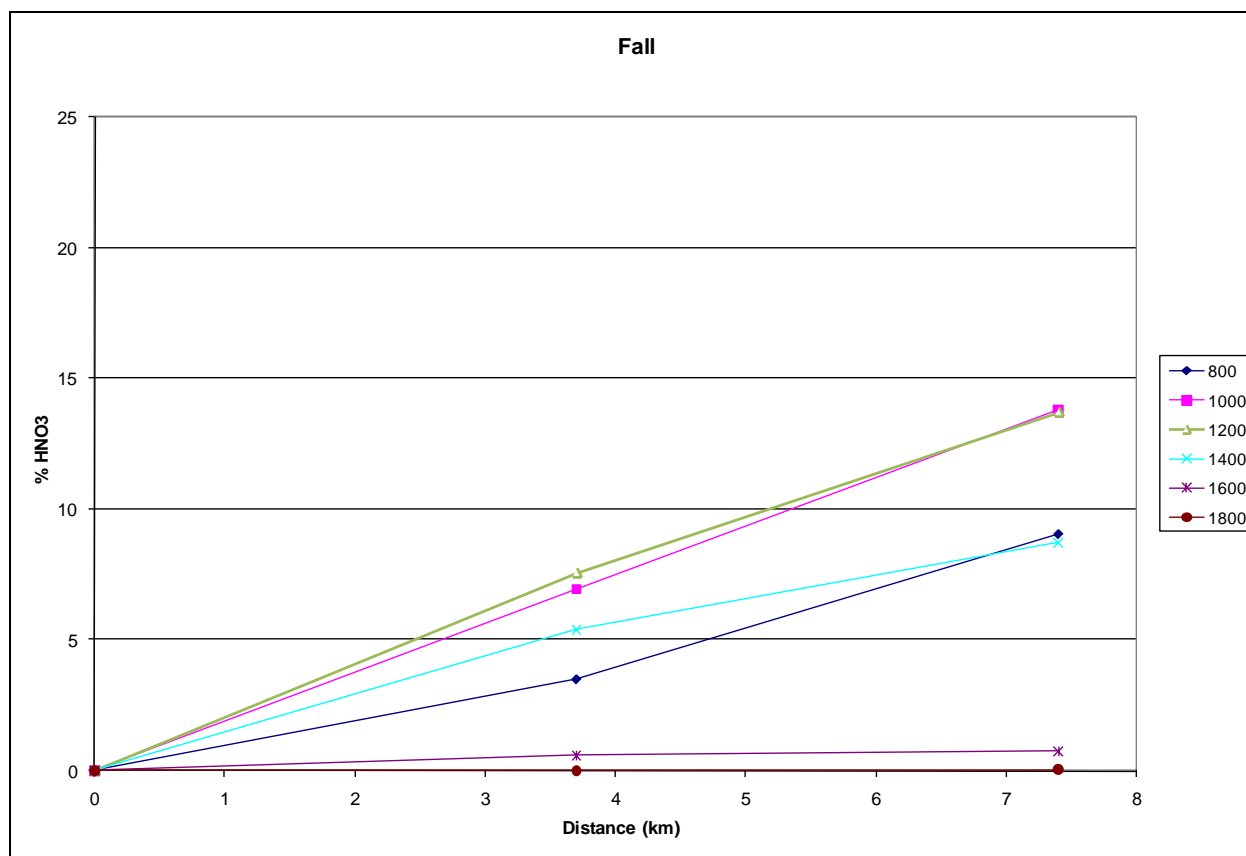
**Figure E-2.** Conversion of  $\text{NO}_x$  to Nitric Acid as a Function of Distance from Source Using Meteorological Parameters Representative of Spring



**Figure E-3.** Conversion of  $\text{NO}_x$  to Nitric Acid as a Function of Distance from Source Using Meteorological Parameters Representative of Summer



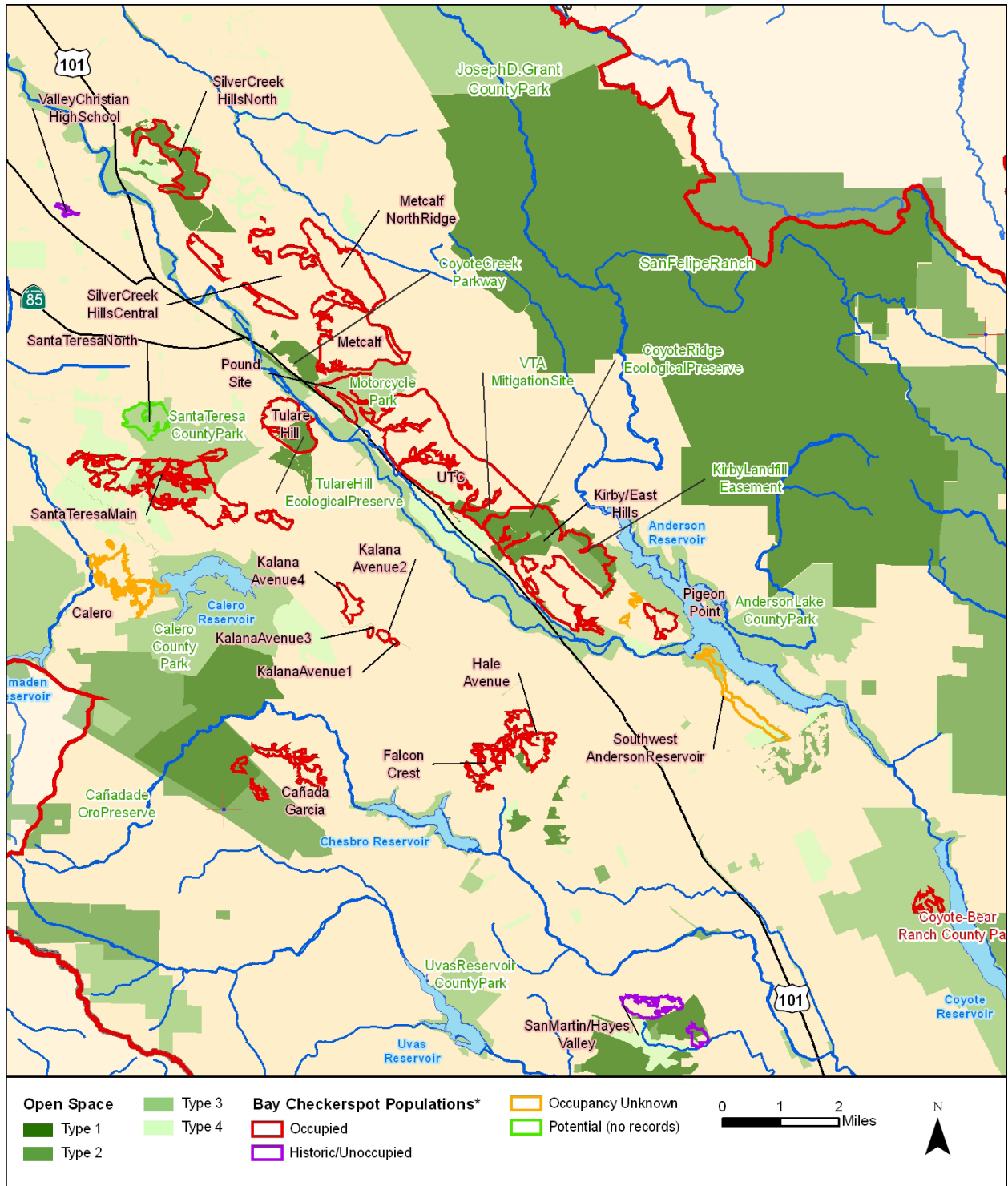
**Figure E-4.** Conversion of  $\text{NO}_x$  to Nitric Acid as a Function of Distance from Source Using Meteorological Parameters Representative of Fall



## Modeling Using the CAL3QHCR Gaussian Model

The modeling domain used for the CAL3QHCR modeling was centered on 37.19N/121.69W and extended 15 km in each direction from that point. This domain extends from southern San José to northern Gilroy and includes several of the habitat areas (See Figure E-5 where habitat areas are shown as colored outlines on the map). Many roadways are located in proximity to the habitat units, the most important of these being US 101, State Route (SR) 85, Monterey Highway/Route 82, Santa Teresa Boulevard, and Hale Avenue. Simulations of Santa Teresa Blvd. and Hale Avenue were combined, so references to Santa Teresa Blvd. include the combined effects of Santa Teresa Blvd. in the north and Hale Avenue in the south. Simulations were run with CAL3QHCR for each of these roadways separately in order to assess their deposition impact separately, and deposition estimates for the base year (2005), 2035, and 2060 were made. Deposition estimates for an assumed overall average  $\text{NO}_2$  air concentration of 20 ppb were also made based on a review of trends monitors in the San José area. (See <<http://www.epa.gov/airtrends/nitrogen.html>>.)

**Figure E-5. Modeling Domain Included in the Gaussian Model Simulations**



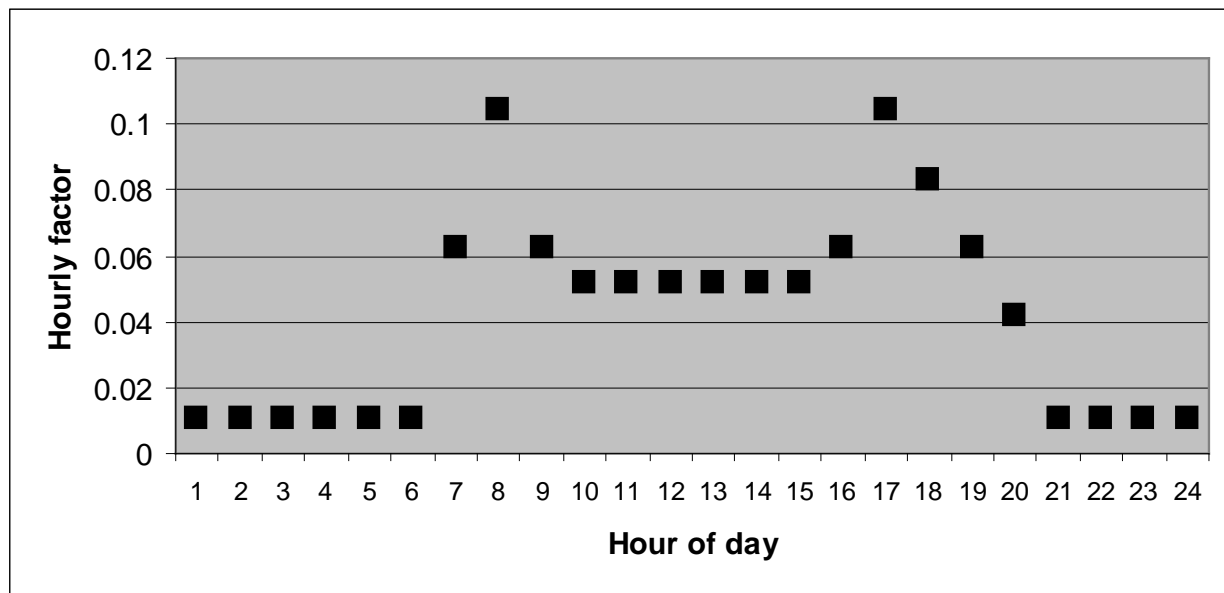
The highways listed above were broken up into segments for the purpose of modeling with CAL3QHC. The intersections defining the intervals on the



highways are shown in Table E-1. Traffic volume between each of the intervals defined by these intersections were acquired from the San José Department of Transportation (Ma pers. comm.) and from summaries of traffic volumes from the California Department of Transportation (State of California 2006). Traffic counts for a base year (2005) and for a projected future year (2030) are provided. Recognizing this may be an overly simplistic methodology, projected traffic counts to 2060 based on the ratio of traffic counts in 2030 to traffic counts in 2005 are also provided. Average traffic counts for each roadway are presented in Table E-2. Note that the traffic counts in Table E-2 implicitly include contributions from projects that have or may have already taken action to accomplish N-deposition mitigation. Our analysis included these trips because we did not have access to data that excluded these projects, nor would it be feasible to exclude those projects consistently. The model results that use these traffic counts do not alter the assumptions used in the fee analysis, but rather provide justification for imposing the fee.

Variation of traffic counts (and hence emissions) during the day was imposed by applying a diurnal profile which varied by hour. The profile was derived from mobile emissions profiles used in the Sparse Matrix Operator Kernel Emissions (SMOKE) Modeling System<sup>4</sup>. The profile is presented in Figure E-6.

**Figure E-6. Diurnal Variation in Traffic Counts (Normalized to Sum to 1)**

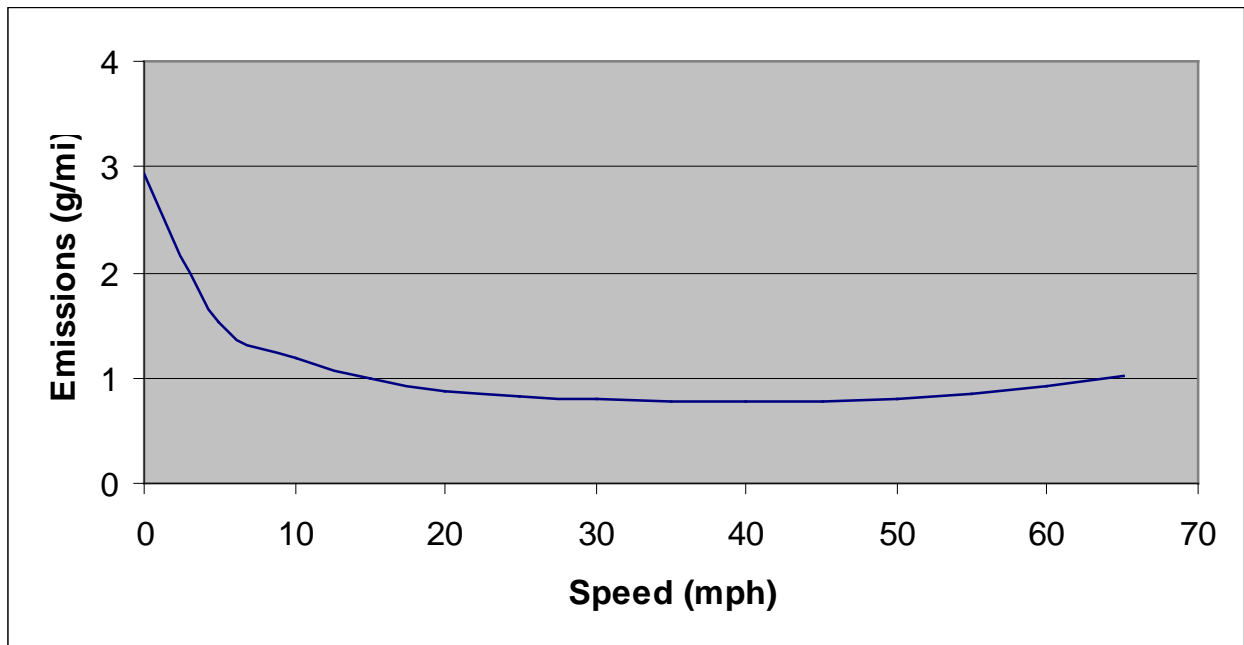


Based on EMFAC2007 simulations, an average emissions rate of 0.915 g/veh-mile of NO<sub>x</sub> emissions was used in order to estimate emissions for the major highway segments (US 101 and SR 85). This rate is based on the assumption of a

<sup>4</sup> SMOKE is a standard processing package used for preparation of emissions for CMAQ and other Eulerian grid models. For more information, see [www.cmascenter.org](http://www.cmascenter.org).

60 mph average speed, a temperature of 70 F and 50% humidity. An average speed of 60 mph is reasonable for this type of road. Note that emissions are not a strong function of speed (see Figure E-7). Temperature and humidity choices represent neither of the extremes of either range and give emissions estimates in roughly the middle of the range predicted by the EMFAC model. The most extreme choices for these parameters could result in only a 50% increase or decrease in emissions. For the Monterey Highway and Santa Teresa Blvd. segments, a lower average speed of 45 mph was used giving an emissions rate of 0.777 gram/vehicle-mile. For reference, the variation of emissions as a function of speed is shown in Figure E-7. Note that the available speed curve does not go above 65 mph. Travel speeds on US 101 and SR 85 could exceed this speed at times which might affect the emissions estimates.

**Figure E-7. Emissions as a Function of Vehicle Speed**



**Table E-1.** Highway Links for Gaussian Model Simulations

Roadway	Links
US 101	Gilroy, North Jct. Rte. 152 West, Leavesley Road Masten Avenue San Martin Tennant Avenue Interchange East Dunne Avenue Morgan Hill, Cochran Road San José, Jct SR 85, Bernal Road Interchange San José, Jct. Rte. 82 North Hellyer Avenue Interchange San José, Capitol Expressway Interchange San José, Tully Road Interchange
Monterey Highway (Route 82, Monterey St, Monterey Rd)	San José, Tully/Pettis Roads San José, Capitol Expressway Interchange San José, Blossom Hill Road San José, Jct. SR 85 San José, Bailey Avenue Morgan Hill, Cochrane Road Morgan Hill, W. Dunne Avenue /E. Dunne Avenue Morgan Hill, Edmundson Avenue /Tennant Avenue San Martin, San Martin Avenue Gilroy, Masten Avenue
Santa Teresa Blvd/ Hale Ave	San José, Snell Avenue San José, Bernal Road San José, Bailey Avenue Morgan Hill, Liagas Road Morgan Hill, Watsonville Road San Martin, San Martin Avenue Gilroy, Fitzgerald Avenue
State Route 85	San José, Jct. Rte. 101 San José, Bernal Road San José, Great Oaks Boulevard Connection San José, Cottle Road Interchange San José, Blossom Hill Road

**Table E-2.** Average Daily Traffic Counts for Simulated Roadways

Roadway	Average Daily Traffic Count		
	2005	2030	2060
US 101	108,383	166,360	306,421
SR 85	87,580	139,393	266,229
Monterey Highway	16,078	40,469	122,235
Santa Teresa Blvd.	4,364	21,260	124,280

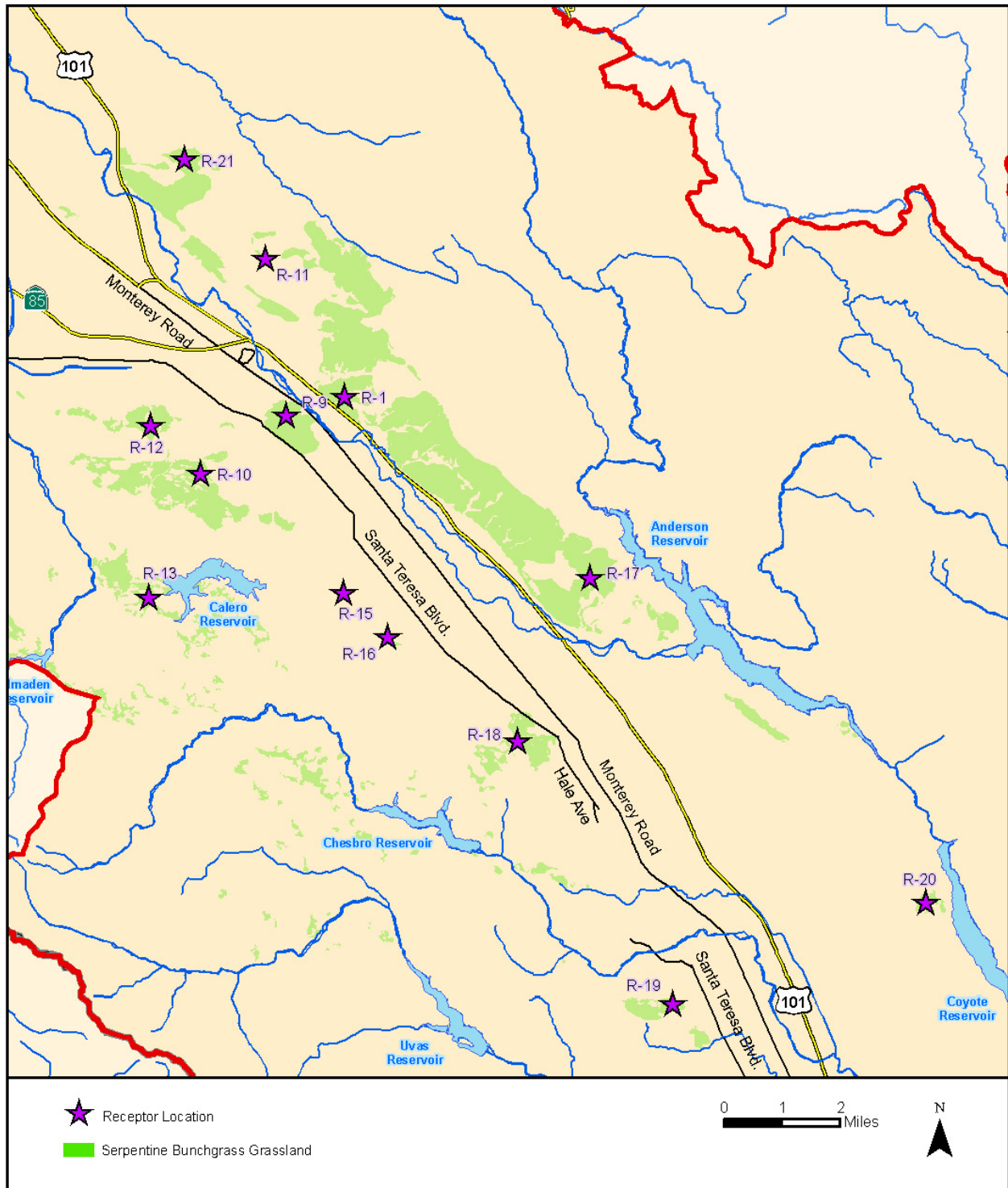
Twenty-one receptors were placed around the domain. Some of these were included to allow a general spatial distribution to be inferred. Others were specifically located in order to characterize effects on the habitat areas (habitat units) of the Bay checkerspot butterfly. Receptors were located in each of the disjoint habitat areas. Several of the receptors are located along the important Coyote Ridge, as noted in Table E-3. The receptors that are directly associated with a habitat area are shown in Table E-3 with the habitat unit that the receptor represents.

**Table E-3.** Receptors Associated with Bay Checkerspot Butterfly Habitat Areas as Defined in the Santa Clara Valley Habitat Plan

Receptor ID	Habitat Area <sup>1</sup>
Rcpt_1	Pound Site (Coyote Ridge)
Rcpt_9	Tulare Hill
Rcpt_10	Santa Teresa Main
Rcpt_11	Silver Creek Hills Central (Coyote Ridge)
Rcpt_12	Santa Teresa North
Rcpt_13	Calero Reservoir
Rcpt_15	Kalana Avenue 4
Rcpt_16	Kalana Avenue 2
Rcpt_17	Kirby Landfill Easement (Coyote Ridge)
Rcpt_18	Hale Avenue
Rcpt_19	San Martin/Hayes Valley
Rcpt_20	Coyote Lake
Rcpt_21	Silver Creek Hills North (Coyote Ridge)

<sup>1</sup> See Habitat Plan Table 5-9 and the Bay checkerspot butterfly species account in Appendix D for a description and map of these sites.

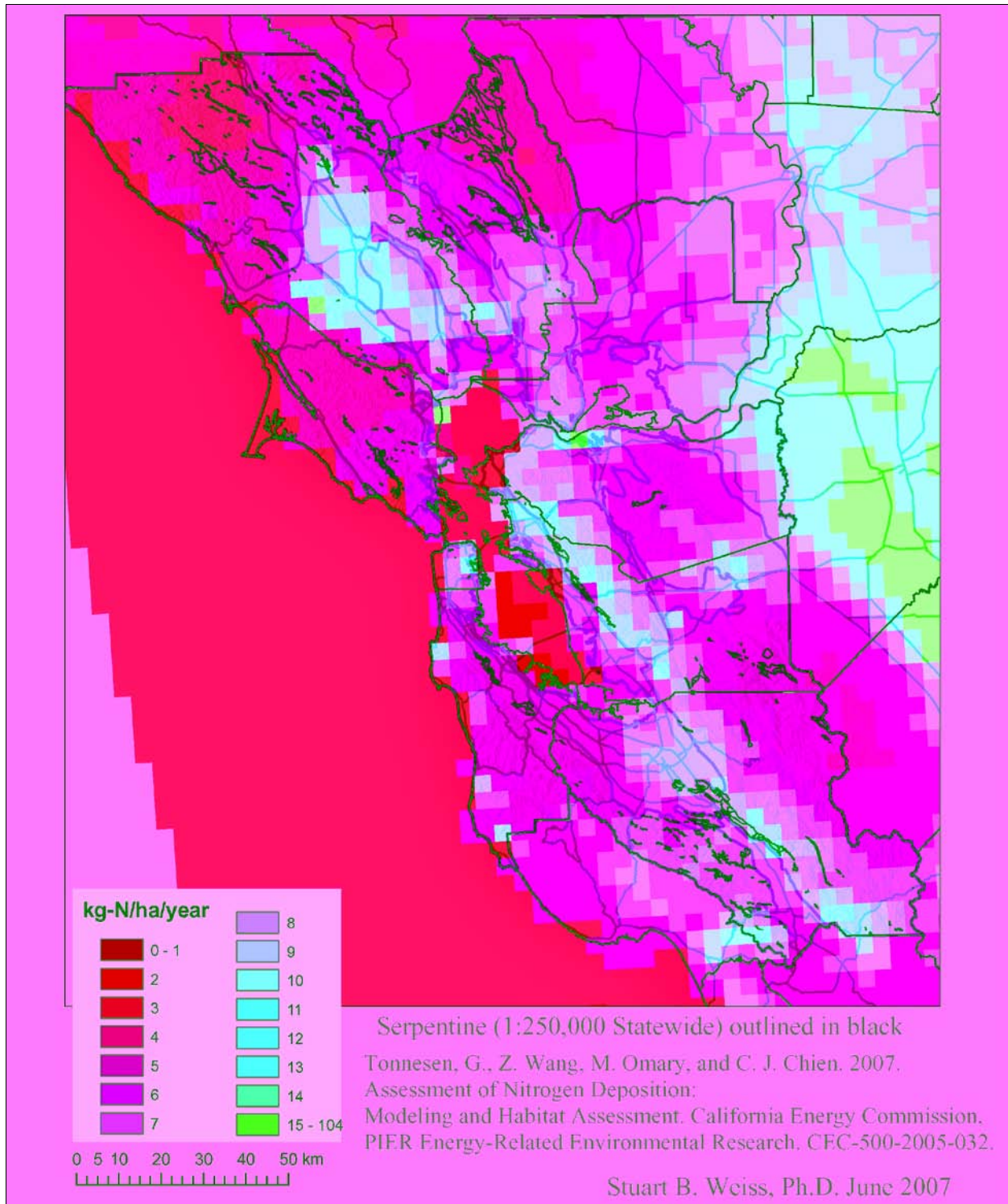
**Figure E-8.** Receptor Locations (Deposition estimates are presented in Figures E-10 through E-24)



The CAL3QHCR code was modified to write hourly concentration estimates and meteorological data to an output file. Deposition velocities were then applied to the simulated concentrations in order to calculate deposition mass at each hour for each of the simulated years. The deposition velocities were derived from the AERMOD deposition algorithm using a diagnostic option available in the model. The deposition velocities vary in time and range from about 0.02 cm/s to 0.4 cm/s, with an average of about 0.2 cm/s. Surface characteristics were developed by the AERSURFACE preprocessor using a center location consistent with the center of the domain used for the Gaussian modeling. The CAL3QHCR model does not calculate deposition. Deposition was calculated after the fact by applying a deposition velocity to the concentrations predicted by CAL3QHCR. Had the model included the deposition calculation internally, the predicted concentration would have been lower due to the effects of deposition. Therefore, the external calculation of the deposition velocities overestimates the amount of deposition. Note that we have not considered ammonia deposition in the Gaussian modeling. Ammonia deposition could add measurably to the total nitrogen deposition because it deposits more readily than NO<sub>2</sub>.

On page 10, we used monitoring data to estimate total ambient NO<sub>2</sub> concentrations to be about 20 ppb. Nitrate concentrations were estimated to be about 0.15 times the NO<sub>2</sub> concentrations. We can make an estimate of the overall nitrogen deposition from all sources by applying the deposition velocities calculated by AERMOD to these ambient NO<sub>2</sub> and nitrate concentrations. The application of the deposition velocities to the 20 ppb estimate of ambient NO<sub>2</sub> results in the total annual deposition listed in Table E-4 for each of the three meteorological years considered. The second line assumes additional deposition due to contribution from nitrates containing 0.15 times the mass of nitrogen in the ambient NO<sub>2</sub>. Appropriate particulate deposition velocities, again derived from AERMOD, were used for estimating the deposition of nitrates. The estimates for nitrates combined with NO<sub>2</sub> give overall deposition in the range of 5.9 to 6.4 kg-N/hectare [ha]/year. This overall estimate of deposition will be useful for comparison to the individual link estimates to be presented later. Based on figures presented by Tonnesen et al. (2007) (See Figure E-9) which showed total nitrogen deposition between 8 to 11 kg-N/ha/year, this overall estimate of deposition is consistent with their modeling based estimates.

**Figure E-9.** Nitrogen Deposition Simulated at 4-km Resolution using the CMAQ as Presented by Tonnesen et al. (2007)



**Table E-4.** Estimated Deposition (kg-N/ha/yr) from Ambient NO<sub>2</sub>

Year	2005	2006	2007
Deposition from NO <sub>2</sub>	4.5	4.8	4.9
Deposition from nitrate	1.4	1.5	1.5
<b>Estimated total</b>	<b>5.9</b>	<b>6.3</b>	<b>6.4</b>

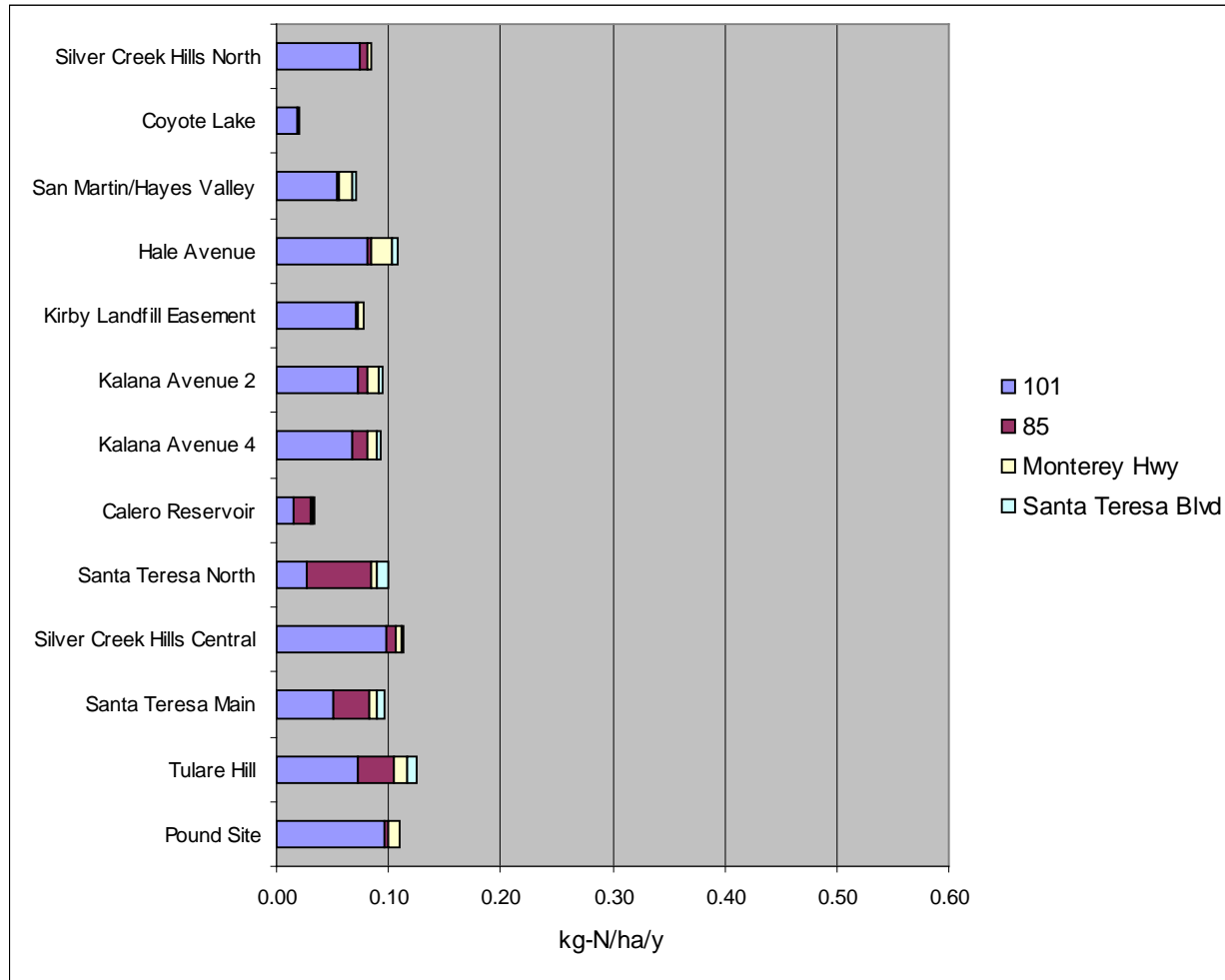
Deposition estimates were made for each receptor (for each of the roadways noted above) and for each of the three meteorological years. The resulting annual total deposition estimates for each receptor for 2005 emissions averaged over the three meteorological years are shown in Figure E-10 and in Table E-5. These estimates use only deposition of NO<sub>2</sub> (i.e., no conversion to nitric acid is considered). At most sites, the simulated deposition from US 101 is higher than the simulated deposition from any other the other roadway links that were simulated. There are some comparable contributions from SR 85 for some of the more northerly receptor locations (e.g., Santa Teresa North). The magnitude of the simulated deposition is less than 0.1 kg-N/ha/y for any single roadway link at any of the receptors. This is only a small fraction of the approximately 6 kg-N/ha/y estimated above based on ambient NO<sub>2</sub> levels. The impact of roadways located some distance from US 101, even though comparable in traffic load such as SR 85, is low compared to US 101. This implies that the traffic on additional roadways not simulated here would not increase the simulated deposition to a level comparable to the ambient calculation. The lower deposition simulated in the CAL3QHCR runs warrants some discussion.

We have alluded to, but not explicitly stated, some potential reasons for lower deposition in the Gaussian model simulations. The Gaussian model simulations consider sources from only a limited area surrounding the habitats. That area includes only a small part of San José and part of Santa Clara County and does not include the remainder of the Bay Area or the rest of the state. We expect (and this expectation is corroborated by the CMAQ tagging simulations presented later) that sources outside of this limited area will also contribute to nitrogen deposition in the habitat area. Only selected, heavily traveled roadways are considered in our simulations. Other roadways not simulated here will contribute to nitrogen deposition, although we expect to a lesser extent than the roadways we are simulating. Chemical transformations may enhance nitrogen deposition. We attempt to account for the chemical effects by assuming some conversion to nitric acid, but it is possible that our necessarily simple approach may still underestimate the effects of these chemical transformations. (The effect of including nitric acid is presented next.)

We must therefore accept that the Gaussian model simulations cannot give an estimate of overall nitrogen deposition. Nevertheless, the comparison of the Gaussian model simulations for different sites and roadway links can give us an indication of which roadways could have the greatest impact on particular habitat areas.



**Figure E-10.** Simulated Annual Nitrogen Deposition using CAL3QHCR with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>



**Table E-5.** Simulated Annual Nitrogen Deposition using CAL3QHCR with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.075	0.006	0.004	0.001	0.085
Coyote Lake	0.019	0.001	0.001	0.000	0.021
San Martin/Hayes Valley	0.054	0.002	0.012	0.003	0.071
Hale Avenue	0.081	0.004	0.018	0.006	0.109
Kirby Landfill Easement	0.071	0.002	0.006	0.001	0.079
Kalana Avenue 2	0.073	0.009	0.010	0.004	0.095
Kalana Avenue 4	0.068	0.012	0.009	0.004	0.093
Calero Reservoir	0.016	0.014	0.003	0.002	0.034
Santa Teresa North	0.027	0.058	0.006	0.010	0.100
Silver Creek Hills Central	0.098	0.008	0.005	0.001	0.113
Santa Teresa Main	0.051	0.031	0.008	0.006	0.097
Tulare Hill	0.072	0.033	0.011	0.008	0.124
Pound Site	0.097	0.004	0.009	0.001	0.110

The total annual deposition differs somewhat depending on which of the three meteorological years is considered. The variation among the meteorological years can be expressed as the maximum percent difference among the results for all receptors. The variation in simulated deposition depending on the meteorological year is largest for the simulation of Santa Teresa Blvd and smallest for the US 101 simulation. The range of variation in deposition due to choice of meteorological year depending on receptor is summarized in Table E-6 for the 2005 emissions. The large variation for Santa Teresa Blvd. is most likely due to differences in prevailing wind direction resulting in very low impacts in some areas for some years but more significant impacts in others.

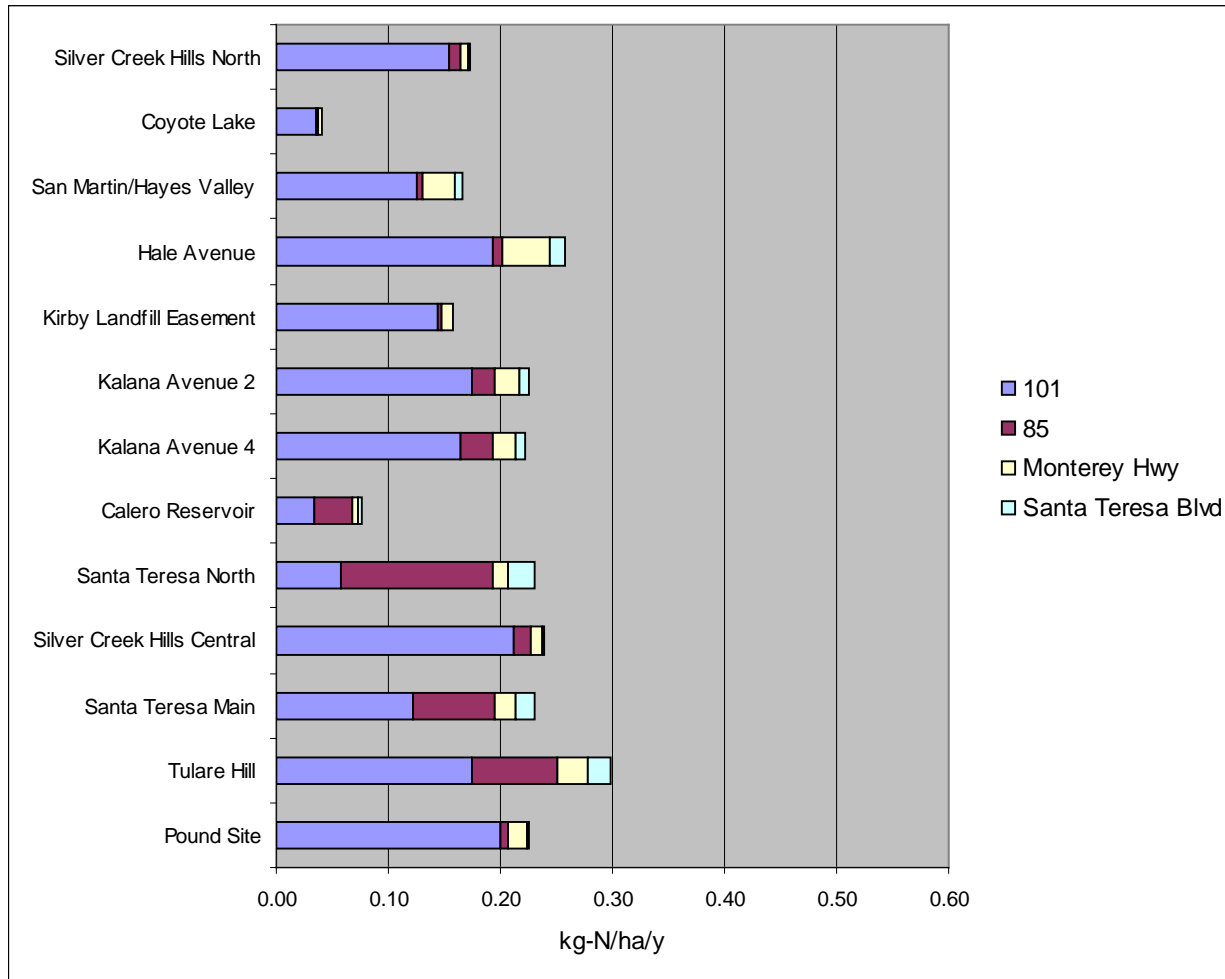
**Table E-6.** Minimum and Maximum Variation among Meteorological Years for the Roadways Simulated Using the CAL3QHCR Model

Roadway	Mean Deposition (Averaged over all receptors) (kg/ha/y)	Minimum Variation (%)	Maximum Variation (%)
US 101	0.070	3	28
SR 85	0.013	1	97
Monterey Highway	0.010	3	54
Santa Teresa Blvd.	0.004	2	1245

Earlier in this report, it was noted that chemical effects, in particular conversion of NO<sub>2</sub> to nitric acid, could enhance deposition of nitrogen. Using the methodology described in the earlier section, deposition was calculated assuming some conversion of NO<sub>2</sub> to nitric acid. Deposition velocities for nitric acid were

derived from AERMOD. The estimates of deposition of nitrogen, including the effects of conversion to nitric acid, are presented in Figure E-11 and Table E-7. The estimates of nitrogen deposition increase by more than a factor of 2 when the effects of nitric acid are included. The maximum simulated deposition from US 101 emissions is slightly more than 0.2 kg-N/ha/y.

**Figure E-11.** Simulated Annual Nitrogen Deposition using CAL3QHCR with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

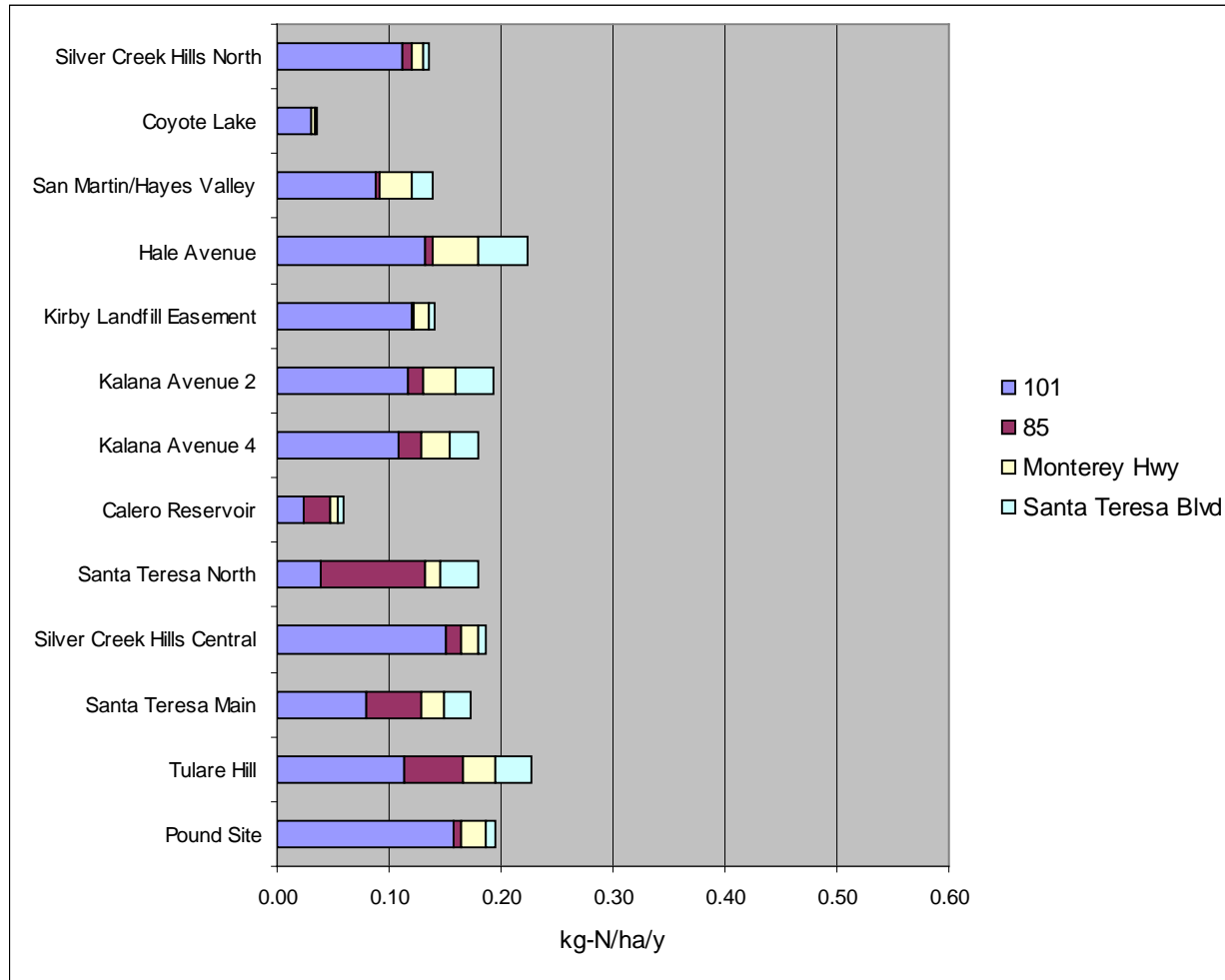


**Table E-7.** Simulated Annual Nitrogen Deposition using CAL3QHCR with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.155	0.010	0.007	0.001	0.173
Coyote Lake	0.036	0.001	0.002	0.000	0.040
San Martin/Hayes Valley	0.126	0.004	0.029	0.006	0.165
Hale Avenue	0.193	0.009	0.043	0.013	0.258
Kirby Landfill Easement	0.144	0.003	0.011	0.001	0.158
Kalana Avenue 2	0.174	0.020	0.023	0.008	0.226
Kalana Avenue 4	0.164	0.029	0.020	0.009	0.222
Calero Reservoir	0.034	0.033	0.006	0.004	0.077
Santa Teresa North	0.057	0.136	0.014	0.024	0.231
Silver Creek Hills Central	0.212	0.014	0.011	0.002	0.239
Santa Teresa Main	0.122	0.074	0.019	0.016	0.230
Tulare Hill	0.174	0.078	0.025	0.020	0.298
Pound Site	0.200	0.007	0.017	0.002	0.226

When the emissions are extrapolated to 2030 reflecting projected increases in traffic volume, estimated deposition increases at all receptors (see Figure E-12 and Table E-8). Note that the relative increase is larger for the (currently) less-traveled roadways than for US 101. In particular, note that when nitric acid is included, the increase in deposition due to Santa Teresa Boulevard is considerable (see Figure E-13 and Table E-9). Traffic volumes are projected to increase several times between 2005 and 2030 on Santa Teresa Blvd. (a larger percent increase than any of the other simulated roadways), so the increase in deposition is consistent with the increased traffic.

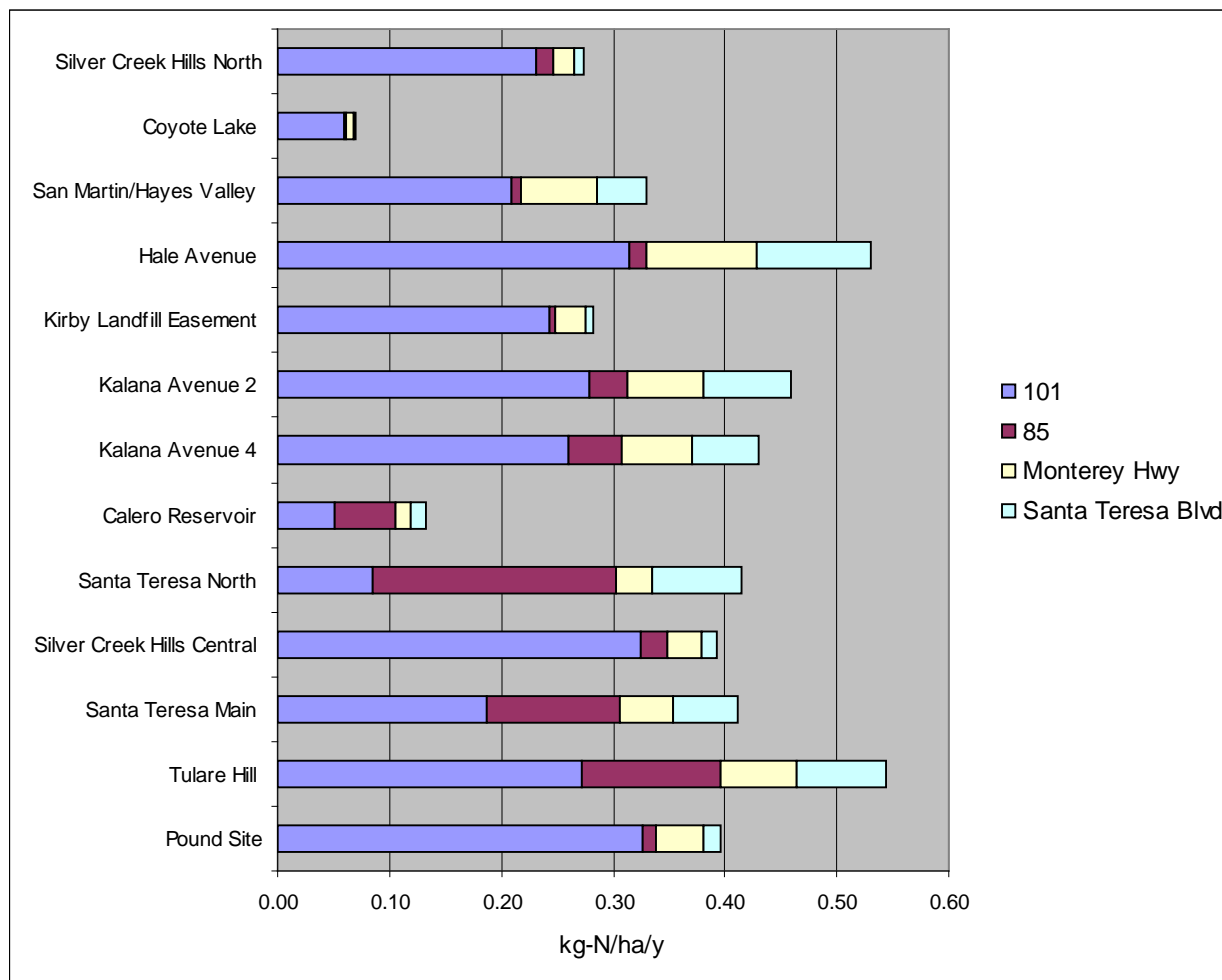
**Figure E-12.** Simulated Annual Nitrogen Deposition using CAL3QHCR with 2030 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>



**Table E-8.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.112	0.009	0.009	0.004	0.135
Coyote Lake	0.030	0.001	0.004	0.001	0.036
San Martin/Hayes Valley	0.089	0.003	0.029	0.019	0.140
Hale Avenue	0.132	0.006	0.042	0.043	0.223
Kirby Landfill Easement	0.120	0.003	0.013	0.004	0.140
Kalana Avenue 2	0.117	0.014	0.028	0.033	0.193
Kalana Avenue 4	0.109	0.020	0.026	0.025	0.180
Calero Reservoir	0.024	0.023	0.006	0.006	0.060
Santa Teresa North	0.040	0.092	0.014	0.033	0.179
Silver Creek Hills Central	0.151	0.013	0.016	0.007	0.187
Santa Teresa Main	0.080	0.050	0.020	0.024	0.174
Tulare Hill	0.113	0.052	0.028	0.034	0.228
Pound Site	0.158	0.006	0.022	0.008	0.194

**Figure E-13.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid



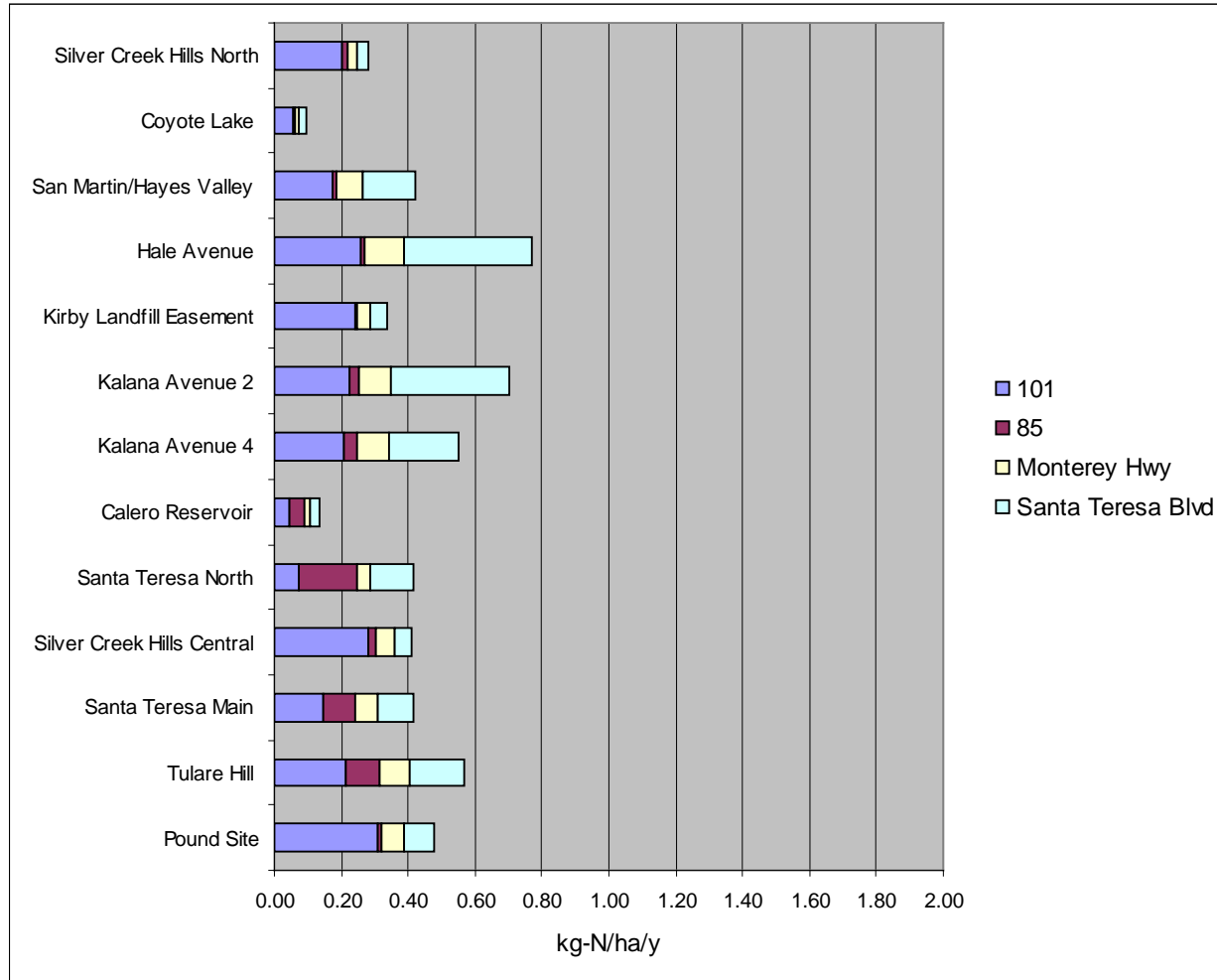
**Table E-9.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.230	0.016	0.019	0.009	0.274
Coyote Lake	0.059	0.002	0.007	0.002	0.070
San Martin/Hayes Valley	0.210	0.007	0.069	0.044	0.330
Hale Avenue	0.315	0.015	0.099	0.103	0.531
Kirby Landfill Easement	0.244	0.005	0.026	0.008	0.283
Kalana Avenue 2	0.280	0.033	0.068	0.078	0.459
Kalana Avenue 4	0.261	0.047	0.062	0.060	0.430
Calero Reservoir	0.051	0.053	0.014	0.014	0.133
Santa Teresa North	0.085	0.217	0.033	0.079	0.414
Silver Creek Hills Central	0.325	0.023	0.031	0.014	0.393
Santa Teresa Main	0.188	0.118	0.049	0.058	0.412
Tulare Hill	0.271	0.125	0.068	0.081	0.544
Pound Site	0.327	0.011	0.043	0.016	0.396

Using the extrapolation of emissions to 2060 shows even greater increases in the deposition estimates. Impacts from US 101 alone reach levels greater than 0.2 kg-N/ha/y (see Figure E-14, and note change in scale for 2060, and see Table E-10). Including nitric acid further increases the estimated deposition (see Figure E-15 and Table E-11). Impacts from US 101 are for some receptors three times the 2005 levels. The extremely large increase in impact from Santa Teresa Boulevard may be an overestimate. Because these emissions were extrapolated, the rate of increase between 2005 and 2030 might not be maintained until 2060.



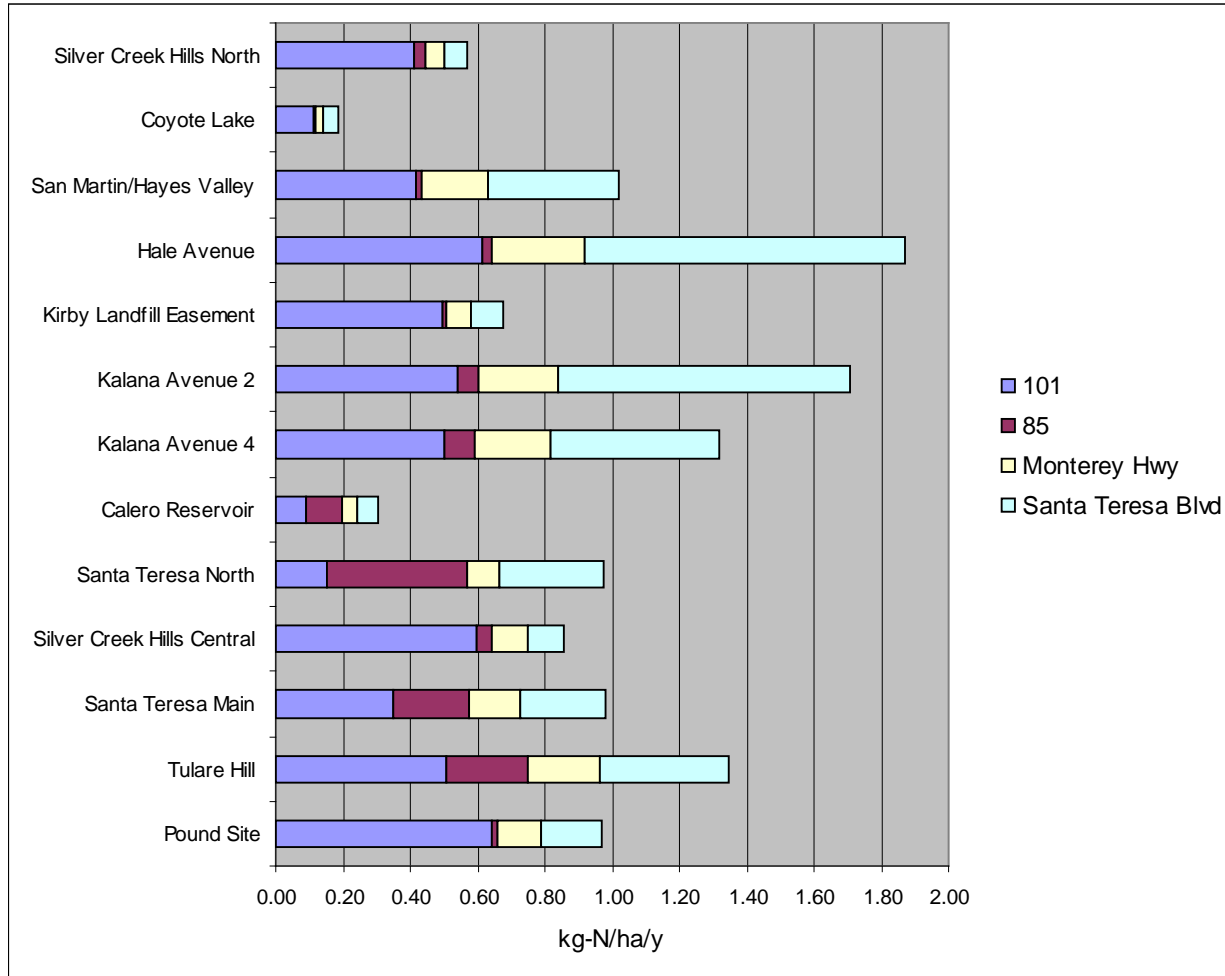
**Figure E-14.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>



**Table E-10.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.200	0.018	0.030	0.031	0.279
Coyote Lake	0.057	0.002	0.012	0.021	0.093
San Martin/Hayes Valley	0.176	0.007	0.081	0.156	0.420
Hale Avenue	0.258	0.013	0.116	0.384	0.771
Kirby Landfill Easement	0.243	0.005	0.039	0.047	0.335
Kalana Avenue 2	0.226	0.028	0.097	0.354	0.705
Kalana Avenue 4	0.209	0.038	0.094	0.208	0.549
Calero Reservoir	0.044	0.044	0.020	0.028	0.136
Santa Teresa North	0.071	0.177	0.041	0.130	0.418
Silver Creek Hills Central	0.280	0.026	0.054	0.053	0.412
Santa Teresa Main	0.148	0.095	0.064	0.108	0.414
Tulare Hill	0.213	0.100	0.091	0.162	0.566
Pound Site	0.310	0.012	0.066	0.090	0.479

**Figure E-15.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid



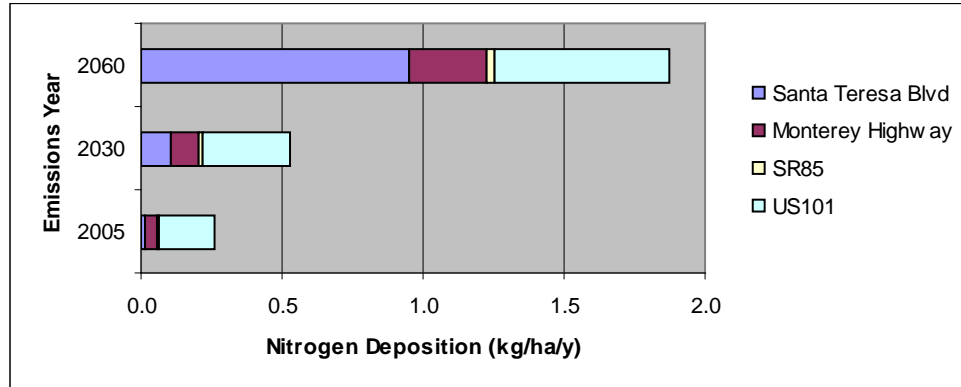
**Table E-11.** Simulated Annual Nitrogen Deposition using CAL3QHCR with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.412	0.031	0.060	0.064	0.567
Coyote Lake	0.113	0.004	0.024	0.046	0.187
San Martin/Hayes Valley	0.418	0.016	0.195	0.389	1.017
Hale Avenue	0.616	0.029	0.273	0.953	1.871
Kirby Landfill Easement	0.495	0.010	0.077	0.095	0.676
Kalana Avenue 2	0.539	0.065	0.236	0.868	1.708
Kalana Avenue 4	0.499	0.091	0.229	0.497	1.316
Calero Reservoir	0.093	0.103	0.045	0.063	0.304
Santa Teresa North	0.150	0.417	0.095	0.311	0.973
Silver Creek Hills Central	0.597	0.044	0.107	0.110	0.858
Santa Teresa Main	0.347	0.227	0.151	0.255	0.980
Tulare Hill	0.508	0.239	0.217	0.383	1.346
Pound Site	0.640	0.021	0.128	0.182	0.971

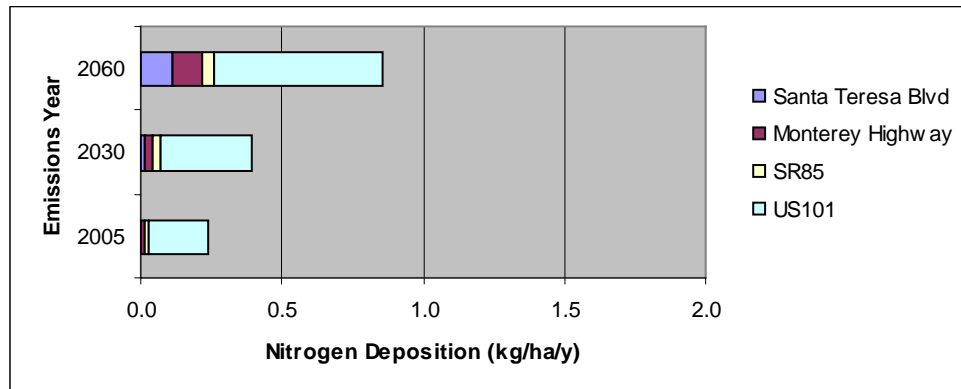
In order to provide a sense of the development of deposition over time, Figures E-16a–d presents stacked bar charts showing all three emissions years and the contributions from the simulated roadways for several habitat areas: Hale Avenue, Silver Creek Hills Central, Santa Teresa Main, and Pound Site. Pound Site and Silver Creek Hills Central, which are located along the Coyote Ridge area east of Highway 101, receive the largest increase in deposition from Highway 101. These sites also see increases in the contribution from other roadways in the area. Sites like Santa Teresa Main which originally saw contributions from several roadways, see increases in all these contributions. The Hale Avenue site sees a dramatic increase in deposition, coming primarily from the Santa Teresa Blvd. simulation. (Recall that the Santa Teresa Blvd. simulation included both Santa Teresa Blvd. and Hale Avenue.) This increase in deposition is due to the relatively larger projected percentage increase in traffic volume on roadways in the southern part of the modeling domain. On all roadways, increases in deposition using emissions extrapolated to 2060 are several times current deposition levels. Keep in mind, however, that the 2060 emissions are extrapolated from projected increases in 2030 and could be overestimated.

**Figures E-16a–d.** Deposition, Simulated Using CAL3QHCR, at Selected Habitat Sites for All Emissions Years, Including Deposition Due to NO<sub>2</sub> and Nitric Acid

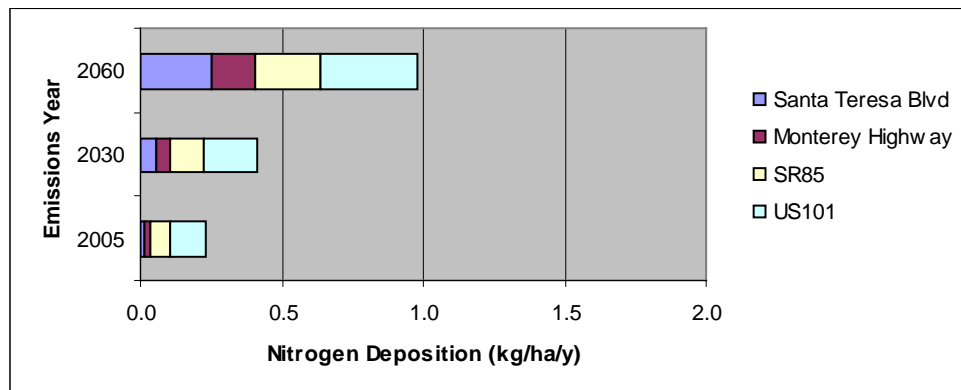
**(16a) Hale Avenue**



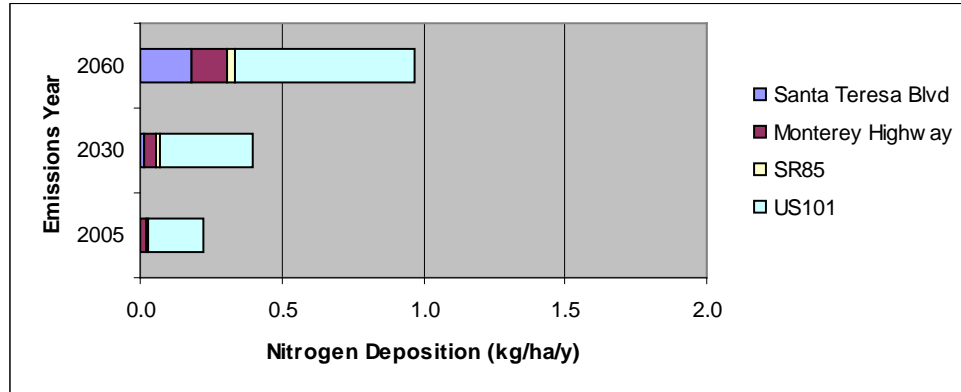
**(16b) Silver Creek Hills Central**



**(16c) Santa Teresa Main**



**(16d) Pound Site**



## Modeling with the AERMOD Gaussian Model

AERMOD simulations were conducted over the same area and for the same meteorological and emissions years as the CAL3QHCR simulations. The emissions for AERMOD were prepared as area sources, using the length of each highway segment as one dimension of each area and an estimated width of the roadway for the width of each segment. Total emissions for each of the roadways within the simulated area is shown in Table E-12.

**Table E-12.** Total Emissions Simulated as Area Sources AERMOD for Each Roadway

Roadway	Total daily emissions (tpd)		
	2005	2030	2060
US 101	2.71	4.26	8.06
Route 85	0.43	0.69	1.32
Monterey Highway	0.31	0.77	2.27
Santa Teresa Blvd.	0.07	0.78	9.73

The AERMOD simulation included gaseous dry deposition of NO<sub>2</sub>. In addition, as a post-processing step, we calculated the enhanced deposition due to inclusion of conversion to nitric acid. The same methodology was used to estimate the conversion as was used for the CAL3QHCR simulations.

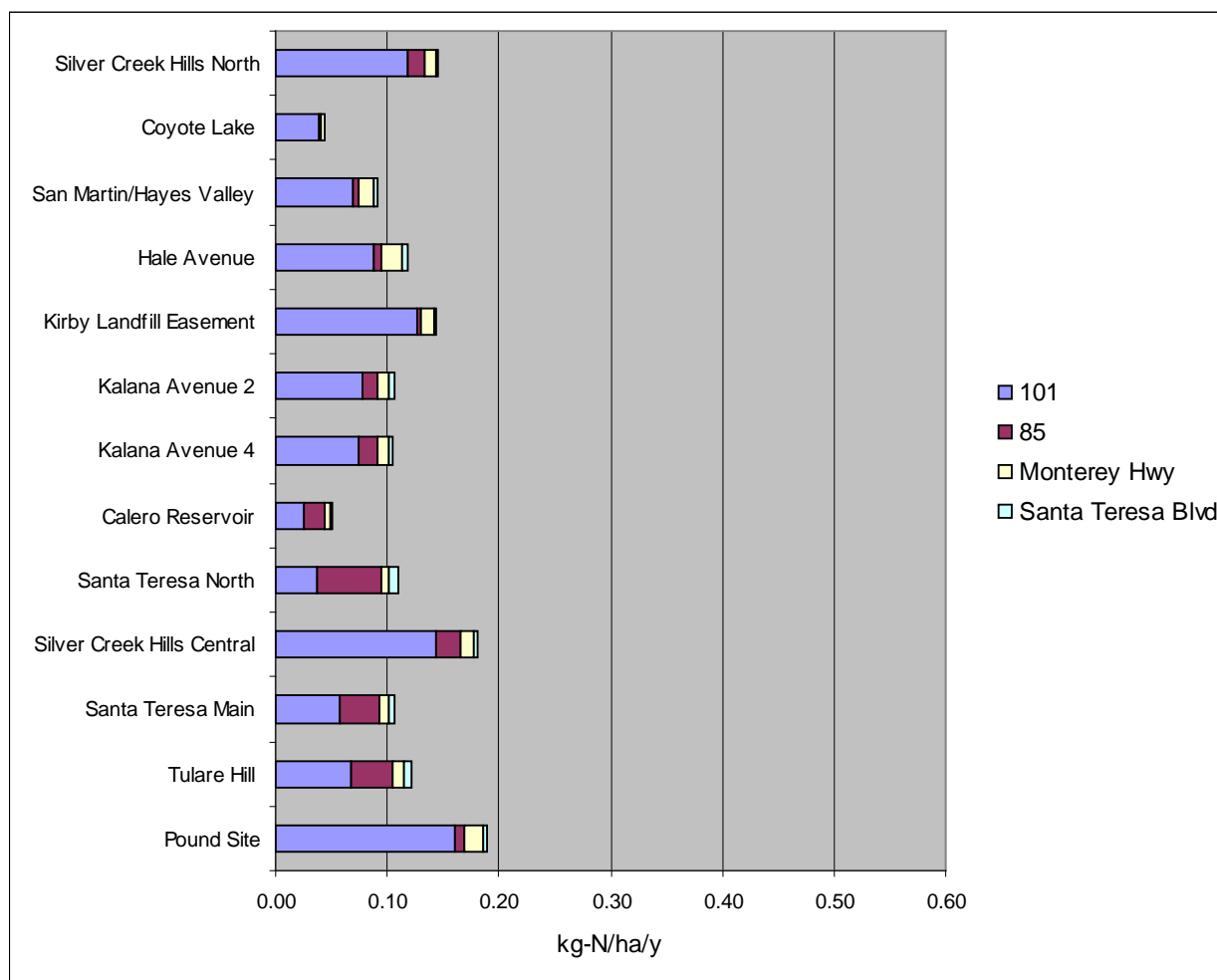
The variation among meteorological years (see Table E-13) is similar for AERMOD to CAL3QHCR for Highway 101 and for Route 85. Maximum variation for Monterey Highway and Santa Teresa Blvd. is smaller using AERMOD than using CAL3QHCR.

**Table E-13.** Minimum and Maximum Variation of Simulated Nitrogen Deposition among Meteorological Years for the AERMOD Simulations

Roadway	Mean Deposition (Averaged over all receptors) (kg/ha/y)	Minimum Variation (%)	Maximum Variation (%)
Highway 101	0.088	4	26
Route 85	0.018	14	96
Monterey Highway	0.012	9	28
Santa Teresa Blvd.	0.004	6	75

The deposition simulated by AERMOD is presented in Figure E-17 and Table E-14 for the 2005 emissions and the average of the three meteorological years. In most cases, the AERMOD simulations produce higher deposition estimates than the CAL3QHCR simulations did. The differences between the two models range from a few percent to over 100% using base emissions and including only NO<sub>2</sub> deposition. The percent differences are smaller when deposition from nitric acid is included. The percent difference between the two models using 2005 emissions levels, with and without nitric acid deposition, is shown in Figure E-17. The maximum deposition estimates for 2005 using AERMOD are about 0.15 kg-N/ha/y.

**Figure E-17.** Simulated Annual Nitrogen Deposition Using AERMOD with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

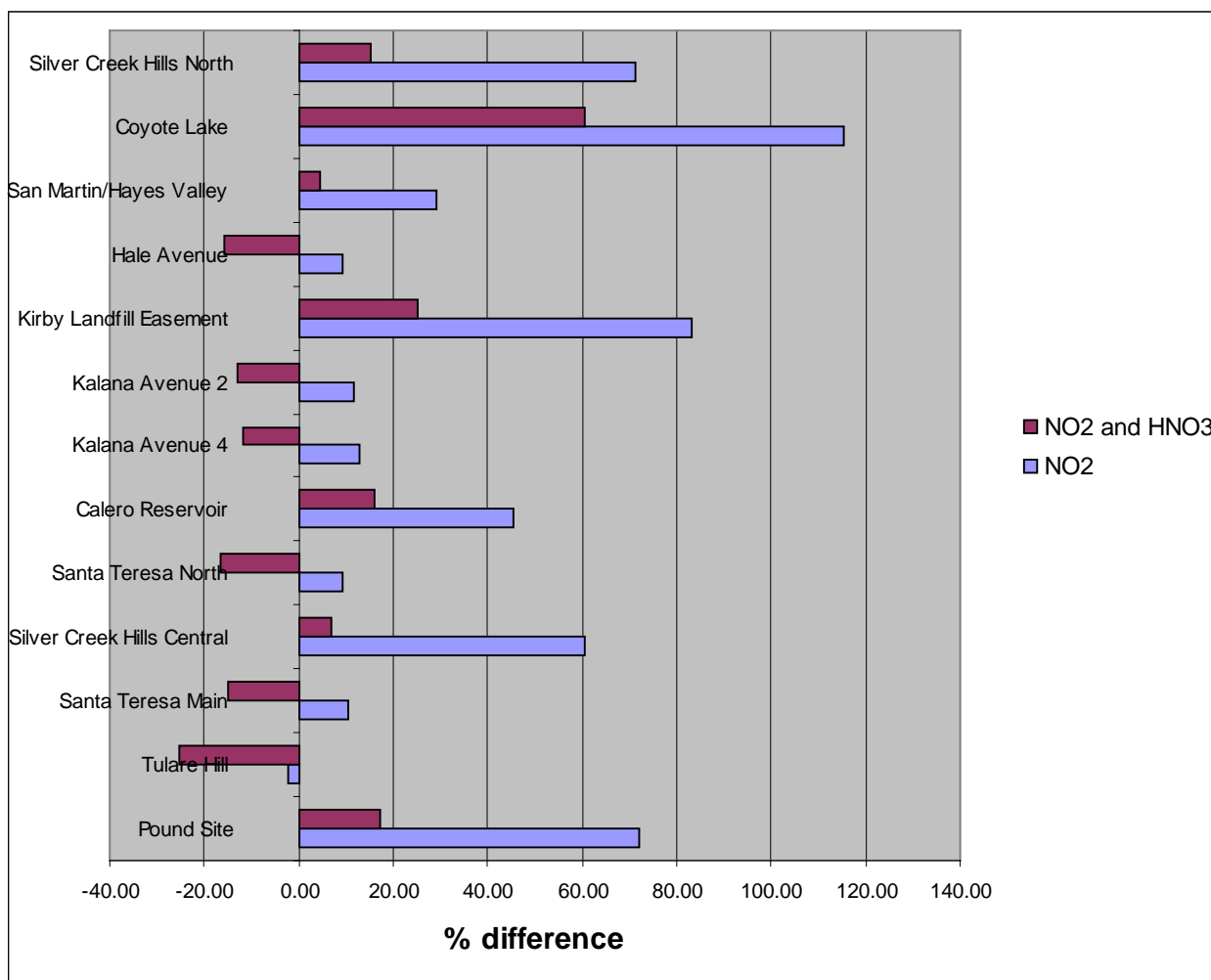




**Table E-14.** Simulated Annual Nitrogen Deposition Using AERMOD with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

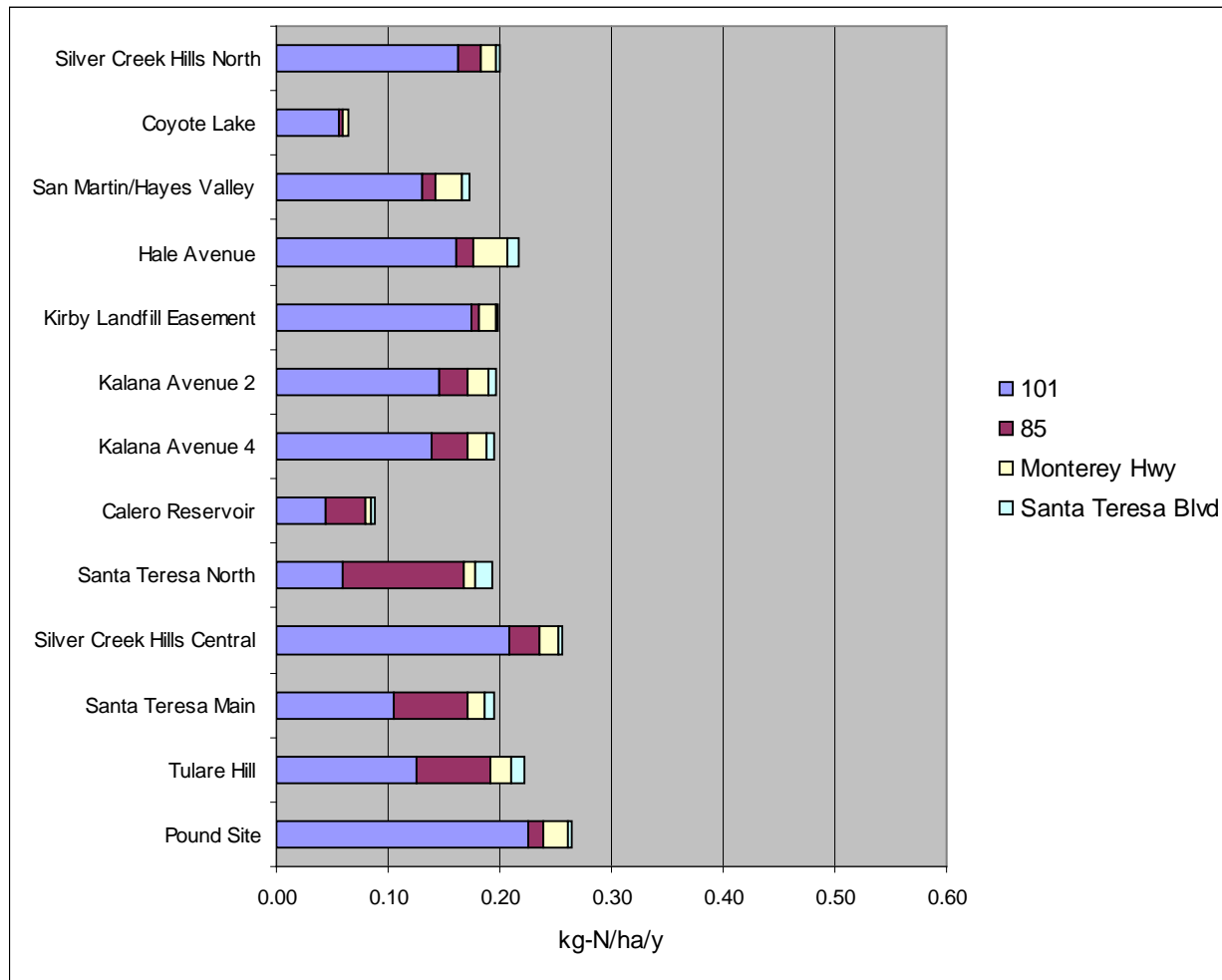
Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.119	0.016	0.009	0.002	0.146
Coyote Lake	0.038	0.002	0.003	0.001	0.045
San Martin/Hayes Valley	0.069	0.006	0.013	0.004	0.091
Hale Avenue	0.087	0.008	0.018	0.006	0.119
Kirby Landfill Easement	0.127	0.004	0.012	0.002	0.144
Kalana Avenue 2	0.078	0.013	0.011	0.004	0.106
Kalana Avenue 4	0.074	0.017	0.010	0.004	0.105
Calero Reservoir	0.026	0.019	0.004	0.002	0.050
Santa Teresa North	0.037	0.058	0.006	0.008	0.109
Silver Creek Hills Central	0.144	0.021	0.012	0.003	0.181
Santa Teresa Main	0.058	0.035	0.008	0.005	0.107
Tulare Hill	0.068	0.036	0.010	0.007	0.122
Pound Site	0.161	0.009	0.017	0.003	0.189

**Figure E-18.** Percent Differences in Simulated Annual Nitrogen Deposition between the AERMOD Simulation and the CAL3QHCR Simulation with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and due to Deposition of NO<sub>2</sub> and Nitric Acid



Including the effects of nitric acid conversion increases the estimated dry deposition of nitrogen in the AERMOD simulation results (See Figure E-19 and Table E-15). Estimated deposition is increased at each roadway and each receptor. Deposition estimates from AERMOD show somewhat more similarity to the CAL3QHCR than when only NO<sub>2</sub> deposition is considered. The maximum simulated deposition at any receptor is greater than 0.2 kg-N/ha/y.

**Figure E-19.** Simulated Annual Nitrogen Deposition Using AERMOD with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

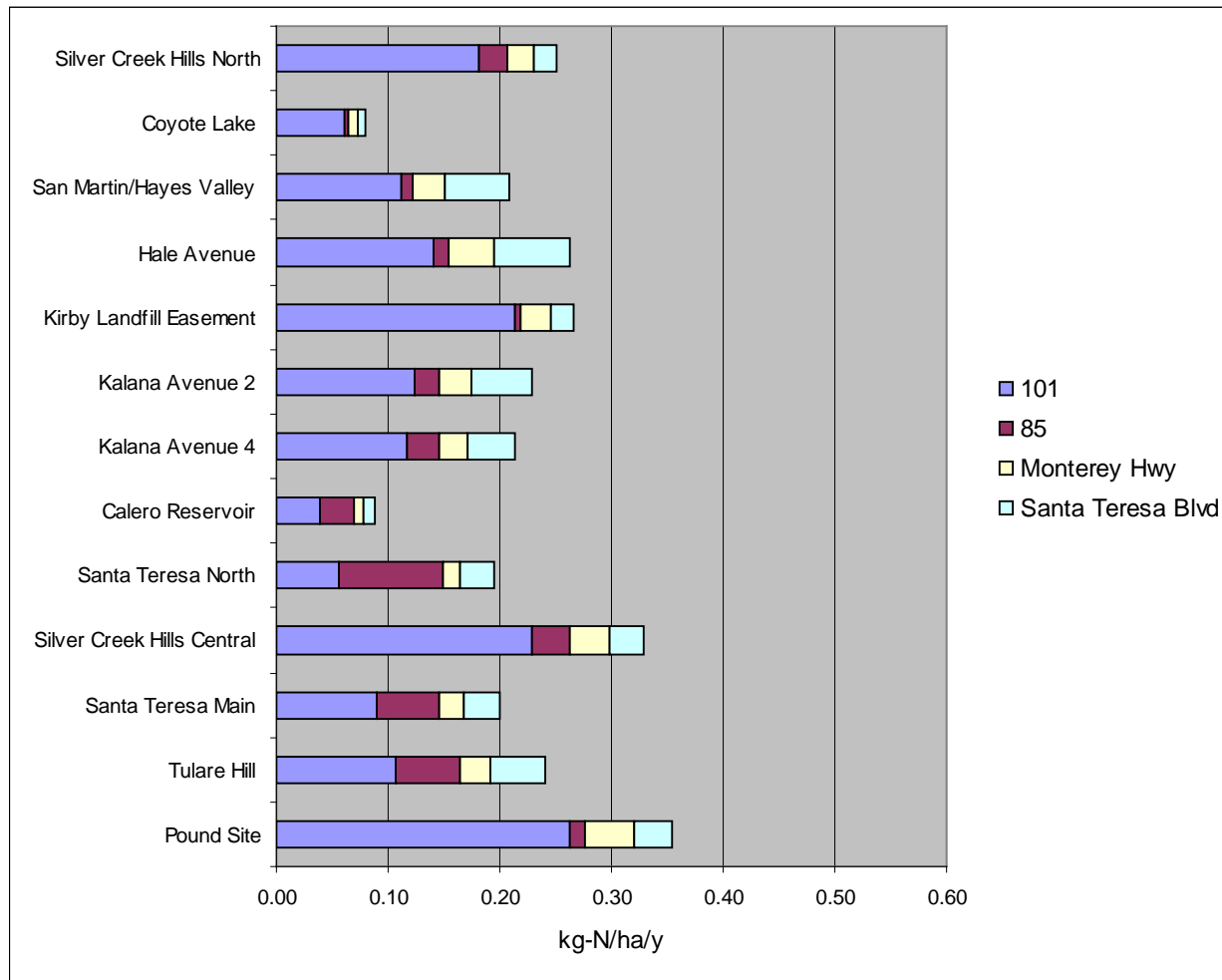


**Table E-15.** Simulated Annual Nitrogen Deposition Using AERMOD with 2005 Emissions Levels Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.163	0.020	0.013	0.003	0.200
Coyote Lake	0.055	0.003	0.005	0.001	0.064
San Martin/Hayes Valley	0.130	0.012	0.024	0.007	0.173
Hale Avenue	0.161	0.015	0.031	0.010	0.217
Kirby Landfill Easement	0.175	0.006	0.016	0.002	0.198
Kalana Avenue 2	0.146	0.025	0.019	0.007	0.197
Kalana Avenue 4	0.139	0.032	0.017	0.007	0.195
Calero Reservoir	0.044	0.035	0.007	0.003	0.089
Santa Teresa North	0.060	0.108	0.011	0.014	0.193
Silver Creek Hills Central	0.209	0.026	0.017	0.004	0.256
Santa Teresa Main	0.106	0.065	0.015	0.010	0.195
Tulare Hill	0.126	0.065	0.019	0.012	0.222
Pound Site	0.226	0.012	0.023	0.003	0.264

The simulated deposition for 2030 using AERMOD are again higher at many sites than using CAL3QHCR for Highway 101 (see Figure E-20 and Table E-16). A few sites, however, have higher simulated values using CAL3QHCR than using AERMOD for the smaller roadways. Including nitric acid deposition increases the deposition estimates from AERMOD (see Figure E-21 and Table E-17). With only a few exceptions, the simulated values from the two models are more similar when nitric acid deposition is included. The maximum simulated deposition using AERMOD with 2030 emissions and including nitric acid is greater than 0.35 kg-N/ha/y.

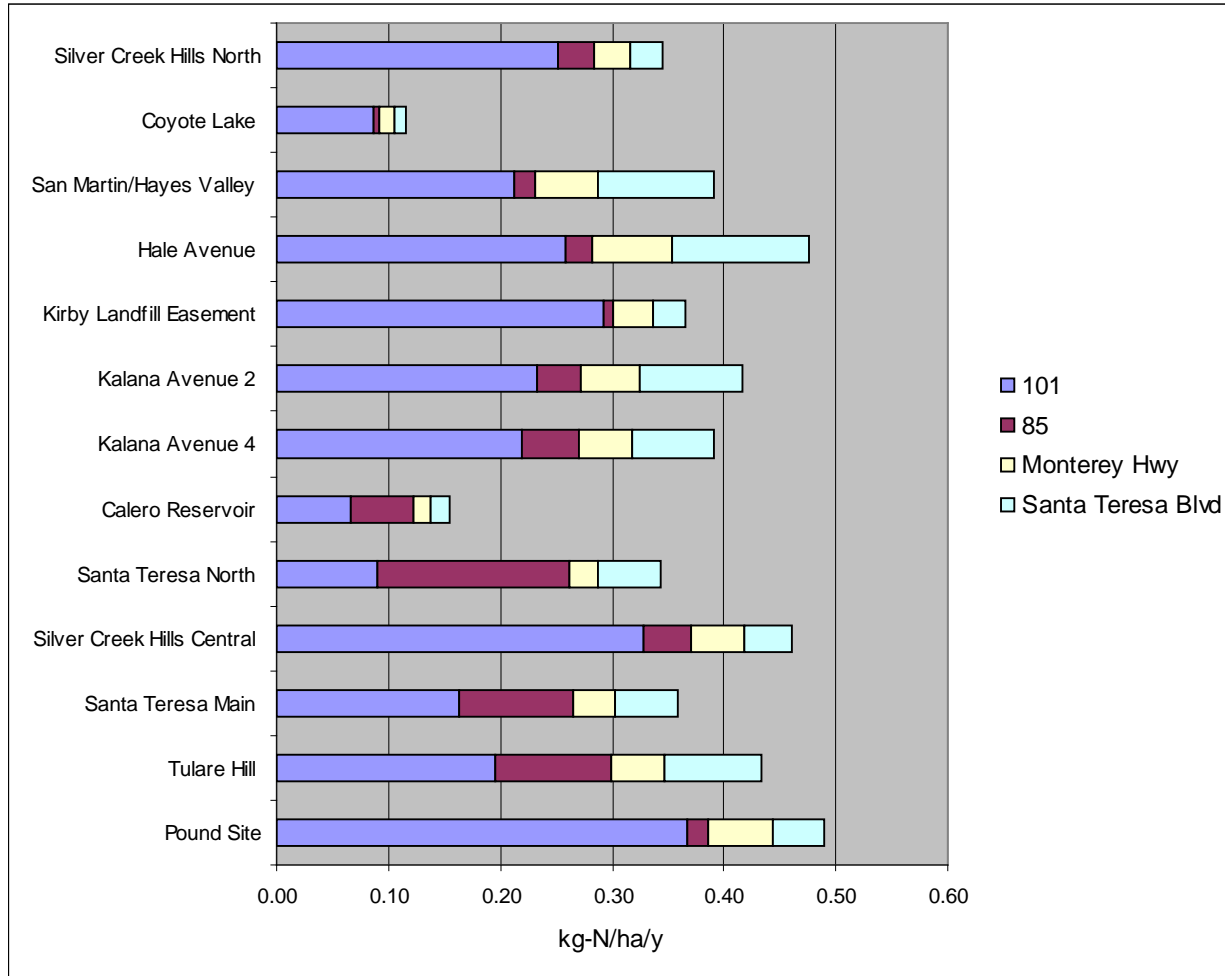
**Figure E-20.** Simulated Annual Nitrogen Deposition using AERMOD with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>



**Table E-16.** Simulated Annual Nitrogen Deposition using AERMOD with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.182	0.025	0.023	0.020	0.250
Coyote Lake	0.060	0.003	0.008	0.007	0.080
San Martin/Hayes Valley	0.112	0.010	0.029	0.058	0.209
Hale Avenue	0.141	0.013	0.041	0.069	0.263
Kirby Landfill Easement	0.213	0.006	0.027	0.021	0.266
Kalana Avenue 2	0.125	0.022	0.029	0.053	0.228
Kalana Avenue 4	0.118	0.028	0.027	0.042	0.214
Calero Reservoir	0.039	0.030	0.009	0.010	0.088
Santa Teresa North	0.056	0.093	0.015	0.031	0.195
Silver Creek Hills Central	0.229	0.034	0.034	0.031	0.329
Santa Teresa Main	0.090	0.056	0.021	0.033	0.200
Tulare Hill	0.107	0.058	0.027	0.050	0.241
Pound Site	0.263	0.014	0.043	0.035	0.355

**Figure E-21.** Simulated Annual Nitrogen Deposition Using AERMOD with 2030 Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid



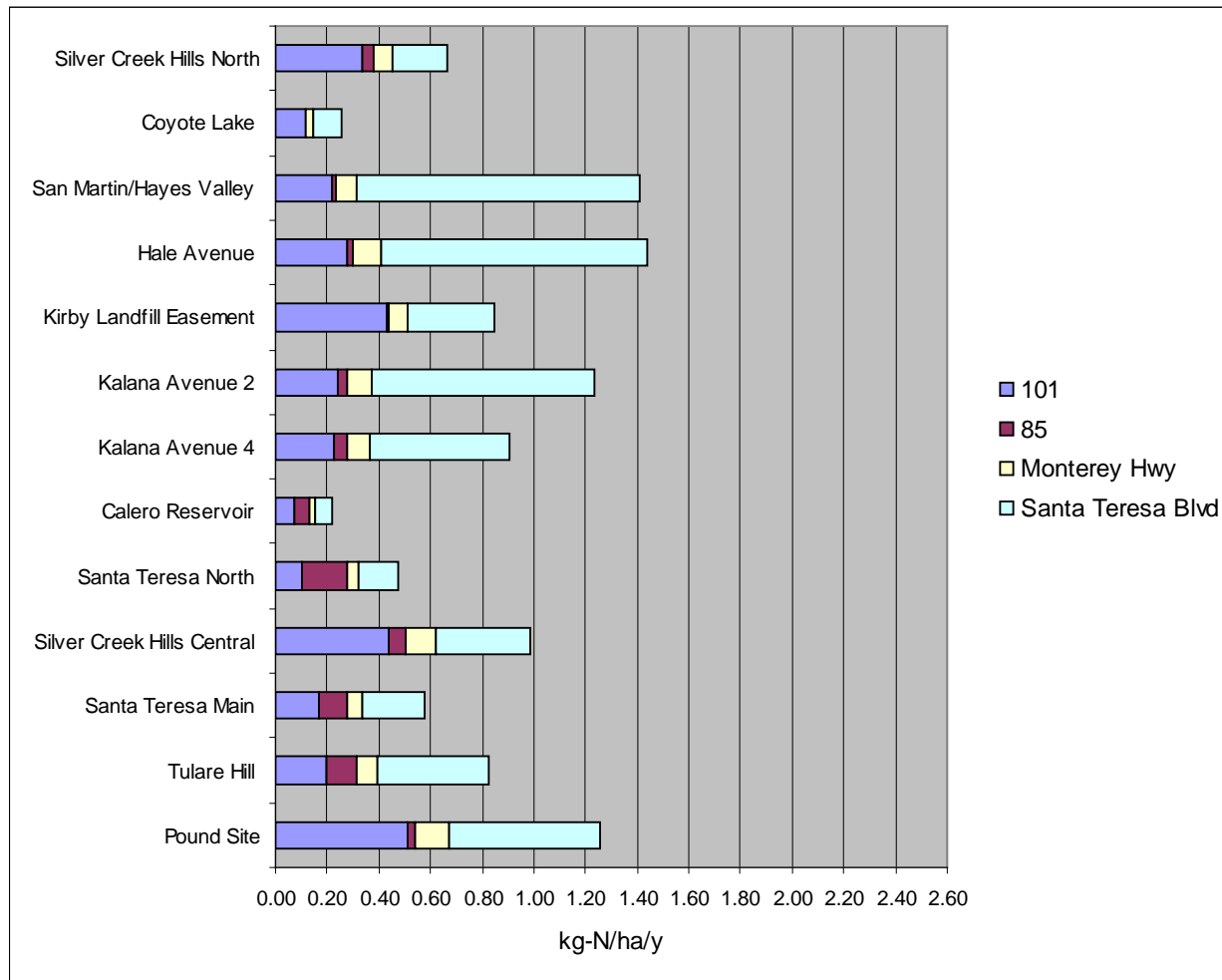
**Table E-17.** Simulated Annual Nitrogen Deposition Using AERMOD with Emissions Levels extrapolated to 2030 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.251	0.033	0.033	0.029	0.345
Coyote Lake	0.087	0.005	0.012	0.010	0.115
San Martin/Hayes Valley	0.212	0.019	0.055	0.104	0.391
Hale Avenue	0.259	0.024	0.071	0.122	0.476
Kirby Landfill Easement	0.293	0.009	0.036	0.027	0.365
Kalana Avenue 2	0.233	0.040	0.052	0.093	0.417
Kalana Avenue 4	0.220	0.051	0.048	0.073	0.391
Calero Reservoir	0.066	0.056	0.016	0.016	0.154
Santa Teresa North	0.089	0.172	0.026	0.056	0.343
Silver Creek Hills Central	0.329	0.042	0.047	0.042	0.460
Santa Teresa Main	0.163	0.103	0.037	0.056	0.359
Tulare Hill	0.195	0.104	0.048	0.086	0.434
Pound Site	0.367	0.019	0.058	0.046	0.490

The simulations using emissions extrapolated to 2060 result in the greatest increases for Santa Teresa Blvd. Maximum simulated deposition due to Santa Teresa Blvd. using AERMOD with these emissions is greater than 1.0 kg-N/ha/y (see Figure E-22 and Table E-18). (Please note the change in scale for the 2060 plots.) When deposition of nitric acid is included, the simulated deposition using AERMOD is considerably higher for Santa Teresa Blvd. than the CAL3QHCR simulations, reaching a maximum of more than 1.9 kg-N/ha/y (see Figure E-23 and Table E-19). The CAL3QHCR simulation results are higher for the next most important roadway in 2060, Highway 101. The reader is once again cautioned that the extrapolation of the emissions to 2060 may not be valid.



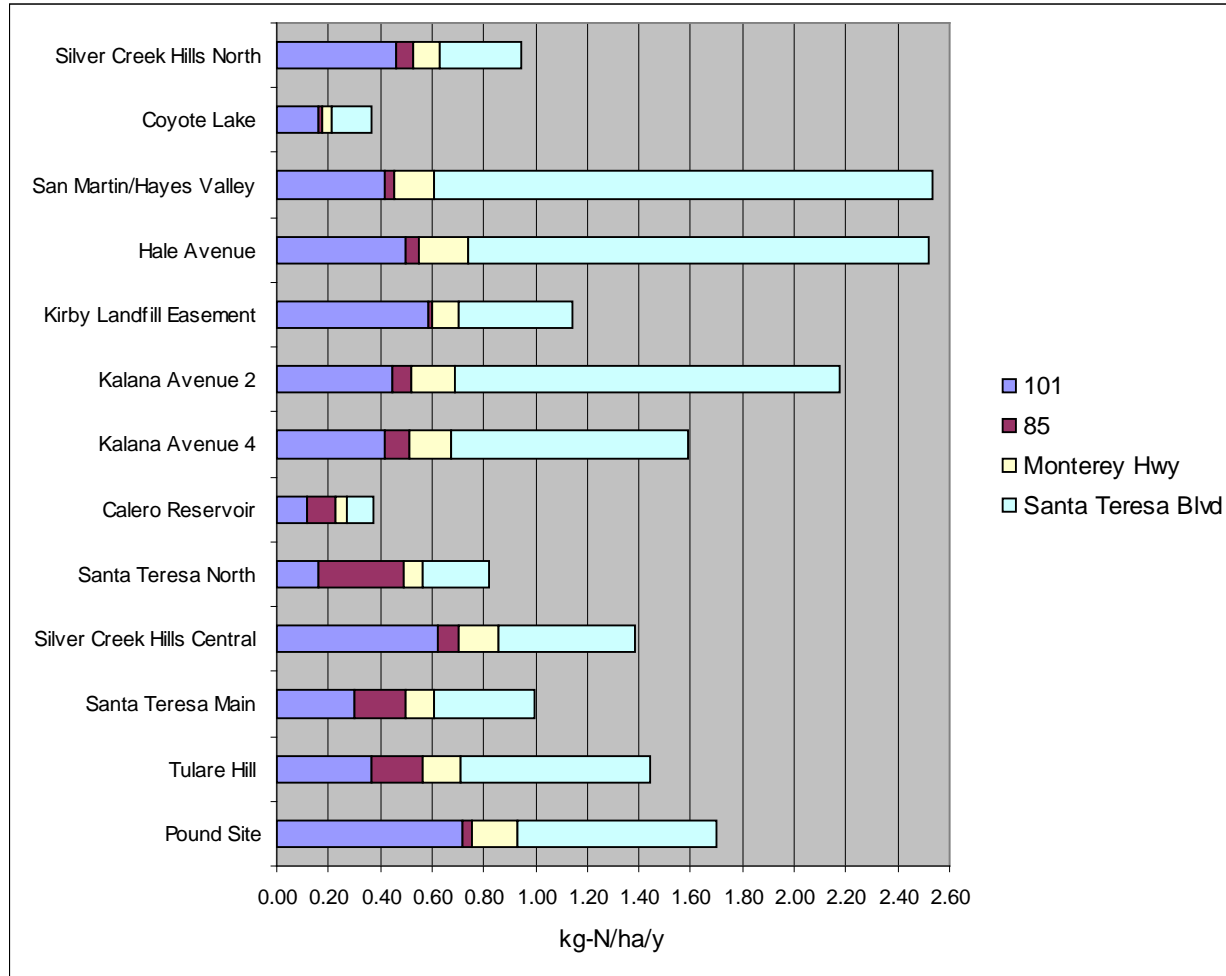
**Figure E-22.** Simulated Annual Nitrogen Deposition Using AERMOD with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>



**Table E-18.** Simulated Annual Nitrogen Deposition Using AERMOD with 2060 Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub>

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.335	0.048	0.072	0.210	0.665
Coyote Lake	0.114	0.006	0.025	0.112	0.258
San Martin/Hayes Valley	0.218	0.019	0.081	1.092	1.409
Hale Avenue	0.274	0.025	0.111	1.028	1.438
Kirby Landfill Easement	0.428	0.012	0.073	0.333	0.847
Kalana Avenue 2	0.240	0.041	0.092	0.864	1.237
Kalana Avenue 4	0.224	0.053	0.088	0.543	0.908
Calero Reservoir	0.072	0.057	0.026	0.063	0.218
Santa Teresa North	0.101	0.179	0.042	0.150	0.471
Silver Creek Hills Central	0.437	0.065	0.115	0.366	0.984
Santa Teresa Main	0.167	0.108	0.062	0.240	0.578
Tulare Hill	0.201	0.111	0.082	0.430	0.824
Pound Site	0.515	0.027	0.133	0.579	1.254

**Figure E-23.** Simulated Annual Nitrogen Deposition Using AERMOD with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid



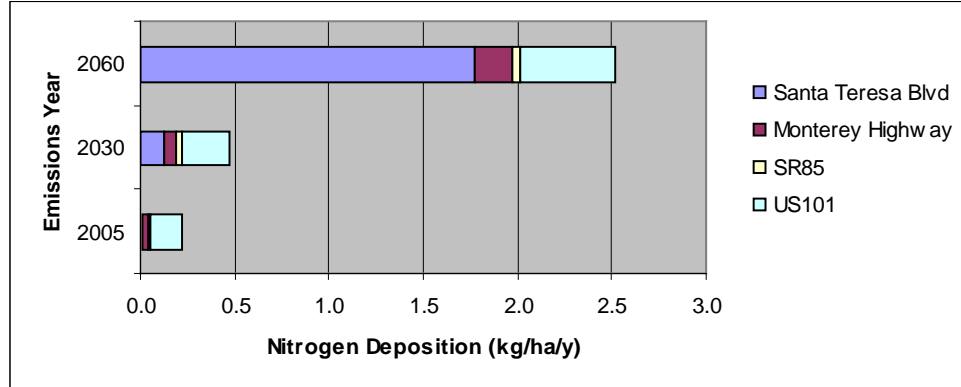
**Table E-19.** Simulated Annual Nitrogen Deposition Using AERMOD with Emissions Levels extrapolated to 2060 Averaged over Three Meteorological Years (2005, 2006, 2007) due to Deposition of NO<sub>2</sub> and Nitric Acid

Site	From US 101	From SR 85	From Monterey Hwy	From Santa Teresa Blvd	Total
Silver Creek Hills North	0.463	0.062	0.101	0.319	0.945
Coyote Lake	0.164	0.010	0.037	0.151	0.363
San Martin/Hayes Valley	0.415	0.037	0.153	1.932	2.537
Hale Avenue	0.501	0.045	0.196	1.775	2.517
Kirby Landfill Easement	0.586	0.017	0.100	0.441	1.144
Kalana Avenue 2	0.445	0.077	0.169	1.487	2.177
Kalana Avenue 4	0.416	0.098	0.160	0.917	1.591
Calero Reservoir	0.120	0.108	0.044	0.099	0.371
Santa Teresa North	0.161	0.330	0.071	0.256	0.818
Silver Creek Hills Central	0.621	0.081	0.156	0.526	1.384
Santa Teresa Main	0.300	0.198	0.109	0.390	0.997
Tulare Hill	0.364	0.200	0.145	0.733	1.442
Pound Site	0.715	0.037	0.176	0.772	1.699

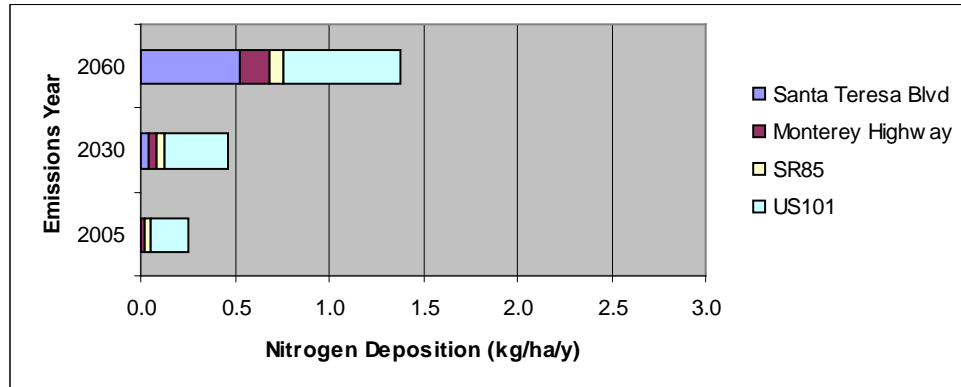
Summaries of the overall deposition simulated in the AERMOD simulations for the Hale Avenue, Silver Creek Hills Central, Santa Teresa Main, and Pound Site habitat areas are shown in Figures E-24a–d. Overall deposition is in general slightly higher than the simulated values from the CAL3QHCR simulations. There is, however, a larger increase in the AERMOD simulations due to the increase in traffic in the southern part of the domain than was predicted by the CAL3QHCR simulations. In the AERMOD simulations, the contributions to deposition at the Hale Avenue site from the simulated roadways are estimated to increase by a factor of more than 10 using the extrapolated 2060 emissions relative to the base year emissions.

**Figures E-24a–d.** Deposition Simulated Using AERMOD at Selected Habitat Sites for All Emissions Years, Including Deposition due to NO<sub>2</sub> and Nitric Acid

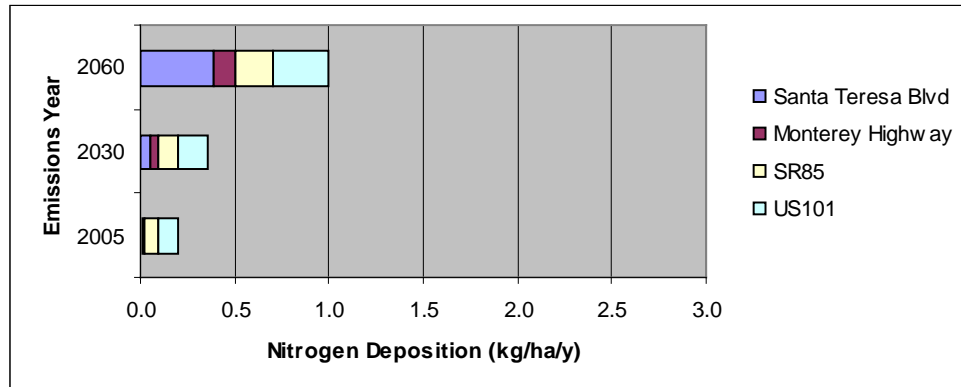
**(24a)** Hale Avenue



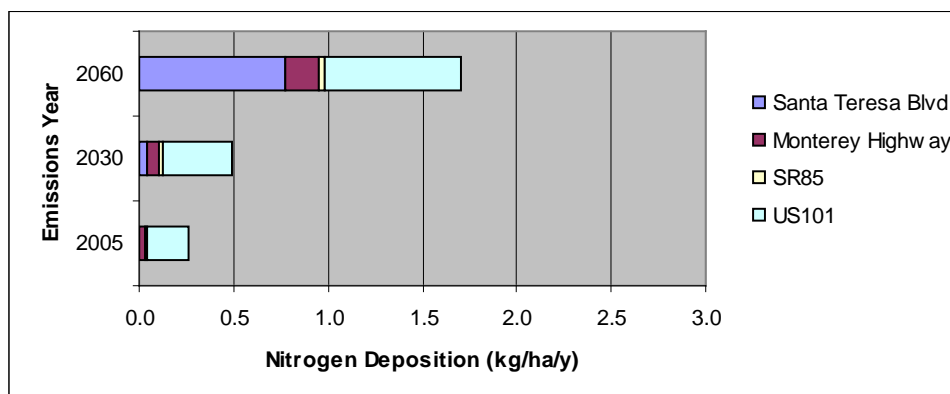
**(24b)** Silver Creek Hills Central



**(24c)** Santa Teresa Main



(24d) Pound Site



## Summary of Gaussian Modeling Results

Two Gaussian models were applied: CAL3QHCR and AERMOD. Nitrogen deposition was calculated from the CAL3QHCR results using deposition velocities derived from AERMOD. AERMOD simulations included dry deposition. For both models, an additional calculation was made to estimate the effects of nitric acid formation on nitrogen deposition. The two Gaussian models produce deposition estimates that are of the same order of magnitude. Maximum deposition from Highway 101 is estimated to be on the order of 0.1 kg-N/ha/y to 0.2 kg-N/ha/y using 2005 emissions. Using emissions extrapolated to the future, estimated deposition is projected to increase considerably, particularly for the currently less traveled roadways. Nitrogen deposition estimates larger than 0.5 kg-N/ha/y were simulated for several roadway receptor combinations using future-year emissions. Ammonia deposition was not simulated using the Gaussian models. Given the nature of Gaussian models, the ammonia deposition will be (to the first order) a linear multiplier of the  $\text{NO}_2$  results. However, the higher deposition velocity of  $\text{NH}_3$  may lead to sharp roadside gradients. Areas close to US 101 in particular may be subject to larger deposition due to the effects of ammonia.  $\text{NO}_x$  deposition for the Coyote Ridge area may be inferred from the results for Pound Site and for Kirby Landfill. Note that these results include only the mobile source contribution from the highways modeled and do not represent overall deposition. Note also that these estimates include only deposition resulting from  $\text{NO}_x$  emissions and do not include ammonia deposition.

For particular roadways and emissions years, one or the other model may produce higher estimated deposition, but both models produce estimates substantially lower than the estimate from the ambient calculation and the CMAQ modeling estimates in the following section (on the order of 6 kg-N/ha/y).

## CMAQ Modeling

This section describes the application of the CMAQ model to simulate nitrogen deposition in the study area. The CMAQ model is an EPA recommended model for regulatory air applications and includes state-of-the-science algorithms for transport, chemistry, deposition, particulate formation, and other atmospheric processes. CMAQ is a data intensive modeling system that requires vastly greater resources to run than the Gaussian models used in the previous sections. Application of CMAQ requires considerable specialized expertise.

## Source Apportionment Methodology

ICF has recently enhanced the CMAQ model to include source attribution capabilities for ozone and particulate matter with the implementation of the Oxidant and Precursor Tagging Methodology (OPTM) and the PPTM. The tagging methods are designed to provide detailed, quantitative information about the *contribution* of selected sources, source categories, and/or source regions to simulated ozone and particulate matter 2.5 microns in diameter or less (PM<sub>2.5</sub>) concentrations, respectively. Emissions of precursor pollutants from selected sources, source categories, or source regions are numerically tagged (i.e., labeled) and then independently tracked throughout a simulation. The contribution from each tag to the resulting simulated concentration of ozone, PM<sub>2.5</sub>, or any of the PM<sub>2.5</sub> component species for any given location within the CMAQ modeling domain can be quantified. By tracking the emissions from selected sources or source locations, the methodology also provides information on the fate of the emissions from these sources, including the contribution of each tagged source to deposition.

The tagging methodology differs from the use of air quality model sensitivity simulations in which the emissions are modified or eliminated (zeroed-out). Sensitivity simulations typically provide information about the effects of changes in the emissions on the simulation results. In contrast, tagging provides information about the contribution of the emissions from the tagged sources, relative to the unmodified simulated conditions. Identifying and quantifying source contributions from certain sources or source sectors can inform air quality planning and aid the identification of effective control strategies.

Applying CMAQ with PPTM provides the same estimate as a standard PPTM run for the overall concentration of each species, but in addition the amount of nitrogen originating from each tagged emissions source or category can be derived from the model outputs. For instance, the amount of nitrogen associated with motor vehicle emissions could be ascertained by setting up a tag of mobile source emissions.

PPTM is implemented in CMAQ with a level of detail consistent with the model. PPTM tracks individual species, taking into account different particle size modes and tracking changes at the process and subprocess level. For example, PPTM

has a separate tracer (or tag) for each nitrogen species (e.g., NO, NO<sub>2</sub>, NO<sub>3</sub>, N<sub>2</sub>O<sub>5</sub>) and each is advected as a separate species using the model algorithms. For sulfate, PPTM tracks each specific change in sulfate due to, for instance, the reaction sulfur dioxide (SO<sub>2</sub>) with OH in the gas phase or the reaction with peroxide or ozone in the aqueous phase. PPTM tracks the changes separately for Aitken mode and accumulation mode aerosols. The level of detail is similar for all particulate matter components.

In this study, CMAQ/PPTM was used to quantify the contributions from selected source regions, which consist primarily of Santa Clara County and other neighboring San Francisco Bay Area (Bay Area) counties, to simulated deposition of nitrogen species to sensitive habitat areas in Santa Clara County.

Within the CMAQ model, PPTM requires the addition of duplicate model species variables for each source, source category, or source region that is to be tagged. The duplicated species may include PM-related sulfur, nitrogen, and secondary organic compounds, as well as primary organic carbon, elemental carbon, and other inorganic particulates. The tagged species have the same properties and are subjected to the same processes (e.g., advection, chemical transformation, deposition) as the actual (or base) species. For this study, the tagged species included all nitrogen species.

CMAQ numerically simulates the physical processes that determine the magnitude, temporal variation, and spatial distribution of the concentrations of each particulate species, including each tagged species. The simulation processes include advection, dispersion (or turbulent mixing), chemical transformation, cloud processes, and wet and dry deposition.

At each time step in the simulation, calculations are performed for the base species and the tagged species. Because the tagged species are separate from the base species, tagging does not alter or affect the base simulation results. The effects of linear processes, such as advection and dry deposition, are calculated directly for all tagged species. Potentially nonlinear processes, such as gas-phase chemistry, aqueous chemistry, and particle dynamics are calculated for the overall (or base) species and apportioned to the tagged species. The results for the tagged species are not normalized to ensure that the sum of the tagged species equals the total. Thus, the difference between the sum of all tags and the overall concentration gives an estimate of the numerical uncertainty in the contribution estimates. The tagged species are included as additional species in the model output files. A discussion of how PPTM is applied for each species and simulation process is provided in the user's guide (Douglas et al. 2007).

## Modeling Databases

The habitat areas of interest in this study are located within an area of approximately 400 km<sup>2</sup>. In order to distinguish the effects of sources local to the habitat areas from sources outside that area, a modeling database with a resolution on the order of 4 km is desirable. Databases with resolution more

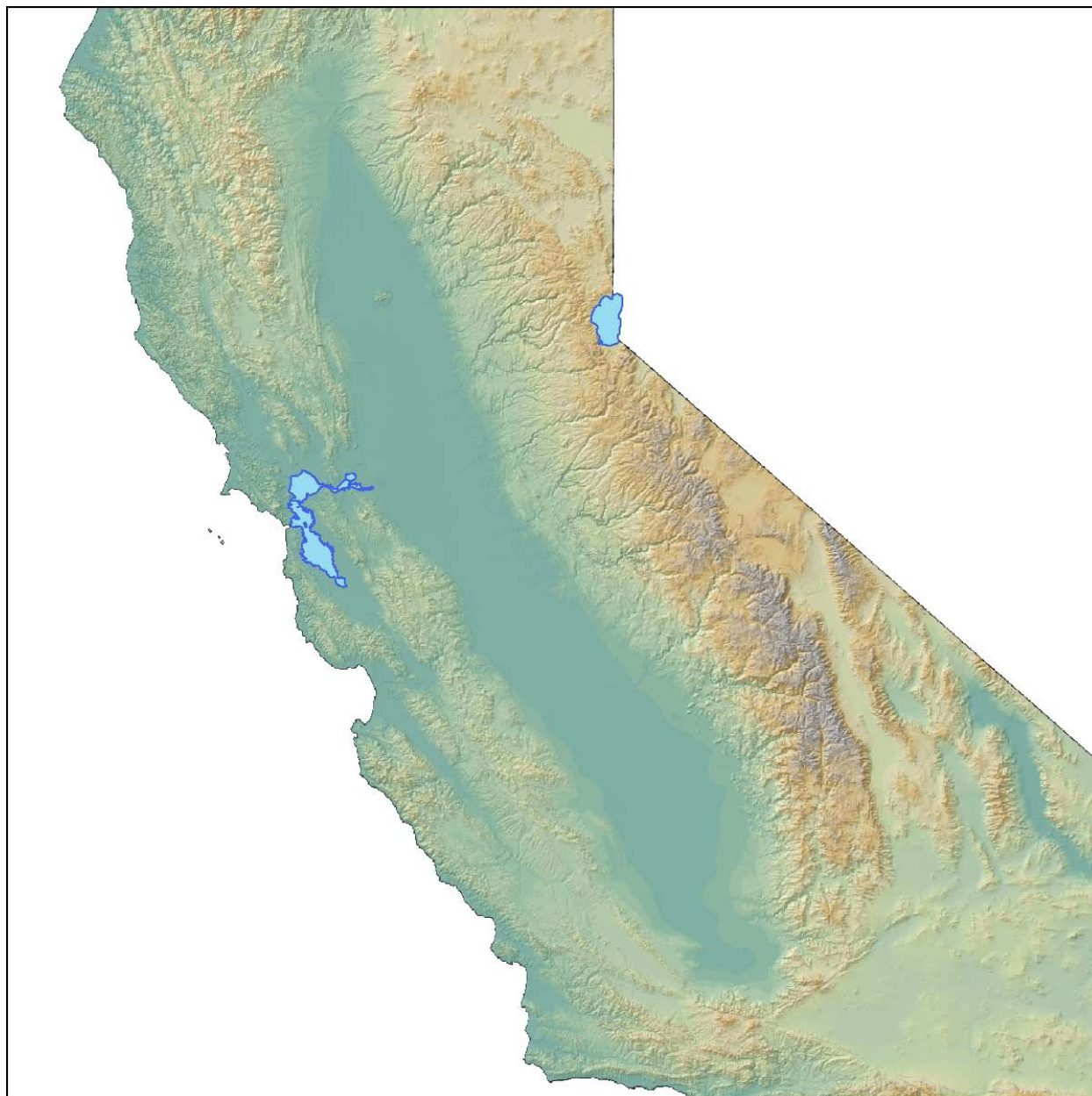


resolved than 4 km are not available for this area. Resolution coarser than 4 km would make it difficult to resolve the area of interest and the emissions within that area. The identification of individual highways such as US 101 within the area surrounding the habitat is not attempted with the CMAQ modeling. The organization of emissions used in the CMAQ modeling does not allow the ready identification of individual roadways. Roadways are tagged collectively within Santa Clara County and within sub-areas of Santa Clara County. The effects of individual nearby roadways have been estimated using Gaussian models (see *Gaussian Modeling* section above).

CMAQ modeling databases for this study were acquired from CARB and from BAAQMD. The databases acquired from CARB included CMAQ-ready input files for an annual simulation of the year 2000 using a domain covering most of California. The results of this simulation were used solely to develop boundary conditions for a higher resolution simulation covering the Bay Area.

The BAAQMD provided a recently developed emissions inventory for the Bay Area counties. This inventory allowed preparation of CMAQ emissions files at 4-km resolution. For the portion of the modeling domain outside of Bay Area counties, emissions were derived from the model-ready files acquired from the CARB. Meteorological inputs for this domain were developed by CARB for a winter episode period covering December 17, 2000, through January 7, 2001, based on the California Regional PM10/PM2.5 Air Quality Study (CRPAQS) monitoring program. As a result of the limited availability of model-ready meteorological data, this was the only period modeled. A high-pressure system moved over central California late in the month of December. A front moved through during the period January 4–5, 2001. During the episode, therefore, the weather was dominated by high pressure. Winds were relatively light, and because it was winter, mixing heights were comparatively low. There was measurable rainfall in the San José area on only two days during the episode. The San José area is semi-arid and hence these conditions are fairly representative of average conditions in the area. Simulation of wet deposition is hindered by the lack of rainfall, but dry deposition is expected to dominate in this area due to the dry climate. Conversion of NO<sub>x</sub> to nitric acid would likely be more rapid during summer months, but mixing heights would be higher which would dilute emissions more rapidly. These effects would apply to all source categories similarly, however, so estimates of relative contributions to deposition would not be greatly altered by the simulation of a longer time period. The modeling domain is shown in Figure E-25.

**Figure E-25.** Modeling Domain for the CMAQ Simulations



Emissions were prepared from the BAAQMD emissions inventory using standard emissions processing procedures and the SMOKE Modeling System<sup>5</sup>. This processing provided emissions for the portion of the modeling domain made up of the Bay Area counties. Bay Area biogenic emissions were prepared using the BEIS3 processor. An emissions inventory consistent with the SMOKE software was not available for the rest of the modeling domain. Therefore, the

<sup>5</sup> SMOKE is a standard processing package used for preparation of emissions for CMAQ and other Eulerian grid models. For more information, see [www.cmascenter.org](http://www.cmascenter.org).

CMAQ model ready emissions files acquired from the CARB were used to define emissions in any grid cell outside of the Bay Area.

## Definition of Tags

Tags were defined to calculate the deposition from local sources in Santa Clara County, sources in the remainder of Santa Clara County, neighboring counties, and elsewhere in the modeling domain. The specific definitions of the tags are as follows.

**Table E-20.** Definition of Tags for Base-Year Modeling

Tag	Tag Description
Tag 1	Anthropogenic emissions originating in San Mateo County.
Tag 2	Anthropogenic emissions originating in Alameda County.
Tag 3	Anthropogenic emissions originating in Contra Costa County.
Tag 4	Anthropogenic emissions originating in San Francisco County.
Tag 5	Anthropogenic emissions originating in other Bay Area counties (Marin, Napa, Sonoma, and Solano).
Tag 6	Area source emissions for Santa Clara County originating in the Bay checkerspot butterfly habitat study area. (see Table E-9).
Tag 7	Mobile source emissions (road and nonroad) for Santa Clara County originating in the Bay checkerspot butterfly habitat study area.
Tag 8	Point source emissions for Santa Clara County originating in the Bay checkerspot butterfly habitat study area.
Tag 9	Anthropogenic emissions for Santa Clara County originating outside of the Bay checkerspot butterfly habitat study area (i.e., Santa Clara County emissions not included in Tags 6 through 8).
Tag 10	Initial and boundary concentrations for the 4-km modeling domain.
Tag 11	Biogenic emissions originating in the 8 Bay Area counties.
Tag 0	All emissions (anthropogenic and biogenic) for rest of the 4-km modeling domain not identified in tags 1–10.

The emissions for each tagged category are summarized in Table E-21. Although several different gaseous and particulate species are listed in the table, only the nitrogen containing species (NO<sub>x</sub>, NH<sub>3</sub>, and the particulate nitrate fraction of PM<sub>2.5</sub>) were subject to the tagging treatment. For reference, the emissions originating in San José are presented in Table E-22. (These emissions can be compared to the emissions for 2030 which are presented in the future-year tagging section. See Table E-25 in that section.)

**Table E-21.** Emissions Summary for Base Year (Average Daily Emissions for the Episode Period)

Tag	Tag Description	CO (tpd <sup>1</sup> )	NO <sub>x</sub> (tpd)	VOC (tpd)	NH <sub>3</sub> (tpd)	SO <sub>2</sub> (tpd)	PM2.5 (tpd)	PMC (tpd)
Tag 1	San Mateo County	244.7	71.4	45.8	6.4	11.9	9.0	10.2
Tag 2	Alameda County	483.6	149.3	101.0	10.7	4.2	18.1	21.9
Tag 3	Contra Costa County	397.5	93.8	95.9	10.7	23.4	22.1	16.5
Tag 4	San Francisco County	182.4	54.3	40.8	4.7	5.4	6.6	8.7
Tag 5	Other Bay Area Counties (Marin, Napa, Sonoma, and Solano)	482.6	96.3	117.6	22.4	21.2	26.0	26.1
Tag 6	Santa Clara County Area Source w/in study area	34.2	3.8	28.7	4.3	0.1	8.6	13.7
Tag 7	Santa Clara County Mobile Source w/in study area	205.3	39.8	22.7	1.4	0.4	1.3	0.4
Tag 8	Santa Clara County Point Source w/in study area	2.4	1.6	2.7	3.7	0.1	0.5	0.1
Tag 9	Santa Clara County, Non-Study Area	333.6	70.8	65.3	8.3	1.6	10.6	12.5
Tag 11	Bay Area 9 Counties Biogenic	28.6	8.9	127.9	0.0	0.0	0.0	0.0
Tag 0	Rest of Domain	8,693.1	1,971.1	1,724.6	569.9	123.5	665.9	1,626.8
<b>Total</b>		<b>11,088.0</b>	<b>2,561.1</b>	<b>2,373.0</b>	<b>642.4</b>	<b>191.8</b>	<b>768.8</b>	<b>1,736.9</b>

<sup>1</sup> tpd = Total daily emissions in tons per day.**Table E-22.** Emissions Summary for Base Year (Average Daily Emissions for the Episode Period) for San José Sources

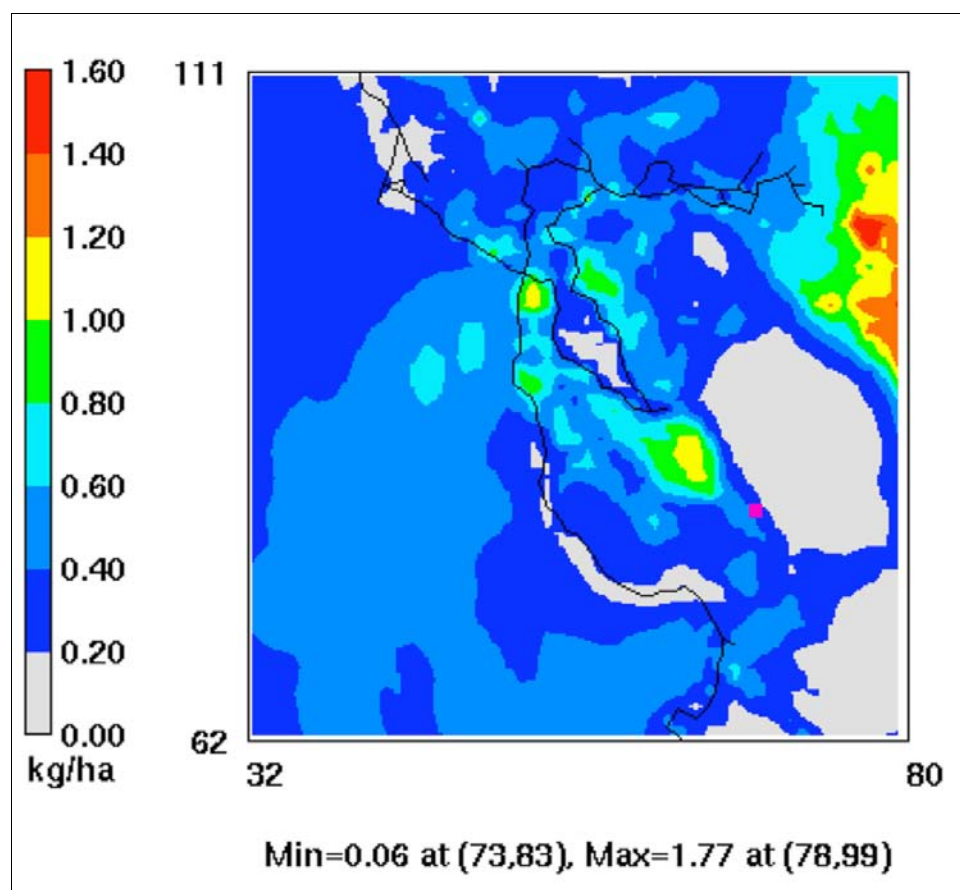
Description	CO (tpd <sup>1</sup> )	NO <sub>x</sub> (tpd)	VOC (tpd)	NH <sub>3</sub> (tpd)	SO <sub>2</sub> (tpd)	PM2.5 (tpd)	PMC (tpd)
San José Area Source	19.4	3.0	14.9	2.5	0.1	4.8	7.7
San José Mobile Source	159.8	30.7	17.4	1.1	0.3	1.0	0.3
San José Point Source	2.2	1.3	2.0	1.5	0.1	0.4	0.1

<sup>1</sup> tpd = Total daily emissions in tons per day.

## Simulation Results

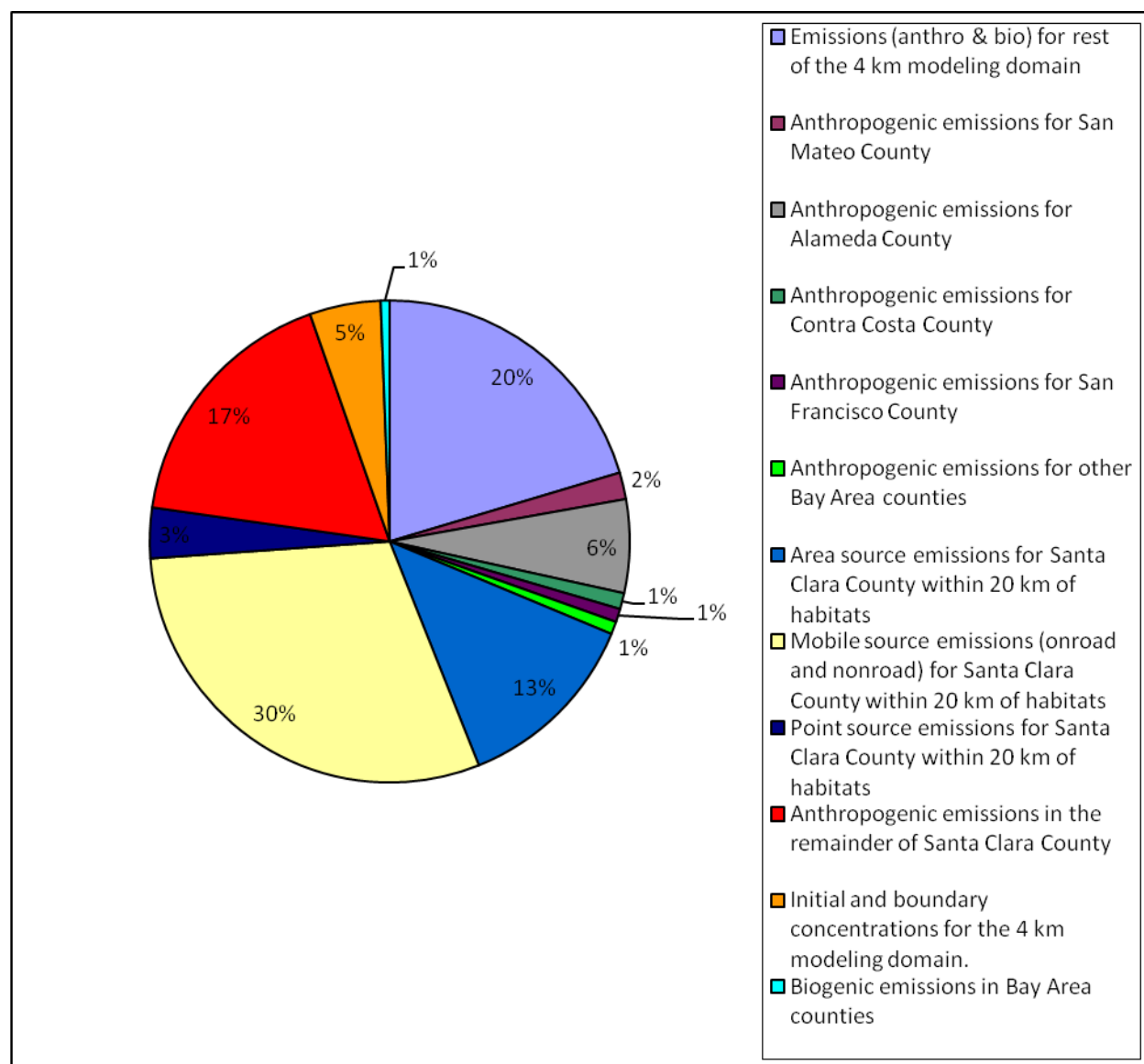
The simulated total nitrogen deposition (wet and dry combined) plot for the 22-day episode from December 17, 2000, through January 7, 2001, is presented in Figure E-26. This display presents a portion of the Bay Area which does not include the entire 185-by-185 grid cell modeling domain. The distribution shows peaks in deposition around the urban areas in the domain, including the San José area in the southern part of the Bay Area. These results are generally consistent with results from other studies such as Tonnesen and others (2007). It must be kept in mind, however, that these studies used different emission inventories and meteorological data files. The modeling also covered different time periods.

**Figure E-26.** Simulated Total Nitrogen Deposition (Wet and Dry) for the 22-Day Episode December 17, 2000 through January 7, 2001



The CMAQ simulation using PPTM provides estimates of the nitrogen deposition from each of the tagged sources of nitrogen listed in the previous section. Nitrogen deposition in all forms (ammonium, particulate nitrate, gaseous species such as NO, NO<sub>2</sub>, etc.) is included in the simulation, but, in the summaries provided here, species have been combined into overall total nitrogen. For the episode period simulated, the sources contributing to nitrogen deposition in the vicinity of Bay checkerspot butterfly habitats are summarized in Figure E-27. It should be noted that because the resolution of the model run is 4 km, the summary does not provide a deposition estimate specifically for the habitat area but rather an average over a 16 km<sup>2</sup> area that includes both habitat area and surroundings. In this case, we refer to the specific grid cell centered at latitude 37.19 N and longitude 121.68 W, which is marked on the map by a pink square.

**Figure E-27.** Simulated Contributions from Tagged Sources of Nitrogen Deposition in the Vicinity of Bay Checkerspot Butterfly Habitat (grid cell at latitude 37.19 N and longitude 121.68 W)



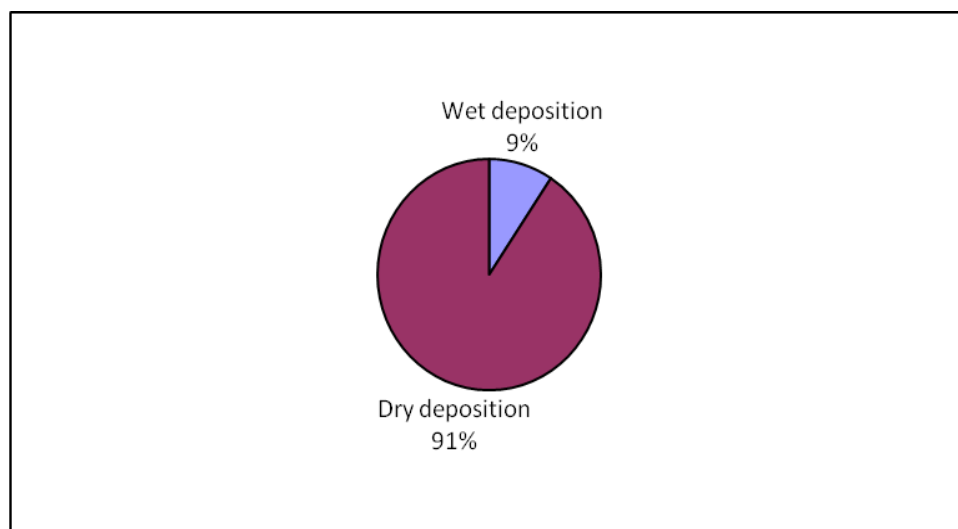
The simulated contributions to nitrogen deposition are spread across many different source categories, but the most important category is mobile source emissions in the vicinity of the habitat areas, contributing almost one-third of the total nitrogen deposition. Other source categories in the vicinity of the habitat also contribute to the total, with 13% coming from area sources within about 20 km of the habitat and 3% from point sources within about 20 km of the habitat. Sources in the remainder of Santa Clara County other than those near the habitat area contribute another 17% to the total nitrogen deposition. When all sources in Santa Clara County are considered, therefore, more than 60% of the total nitrogen deposition is accounted for.

Of the sources outside of Santa Clara County, the largest contributor at 20% is the tag representing sources in the modeling domain that are not in one of the Bay Area counties. This tag includes emissions from most of California (other than the Bay Area counties) except for a portion of southern California. This tag also includes a portion of Nevada.

Bay Area counties other than Santa Clara also contribute to nitrogen deposition in the habitat area. The contributions range from less than 1% (northern Bay Area counties are tagged collectively as other Bay Area counties) to 6% for Alameda County in this episodic simulation. Each of the other tagged counties (San Francisco, San Mateo, and Contra Costa) contributes 1–2% of the nitrogen deposition. The contributions simulated here for these individual counties could be dependent on the meteorological conditions during the episode that was simulated, and the relative contributions among these counties might vary for other time periods.

Figure E-28 shows the breakdown between simulated wet and dry deposition of nitrogen in the vicinity of the habitats. Deposition is dominated by dry deposition, which is consistent with the observed rainfall data during the episode period. Only two days during the episode had measurable rainfall. Annual deposition would likely be dominated by dry deposition, so the limited rainfall is not detrimental to our interpretation of the contributors to nitrogen deposition. Tonnesen et al. (2007) conducted annual CMAQ modeling that included the San José area. Tonnesen's simulations indicate annual dry deposition of between 47 and 811 kg-N/ha/y with less than 2 kg-N/ha/y of wet deposition. Monthly plots presented in their reports show a ratio of dry to wet deposition of at least 4:1 in January and at least 10:1 in July.

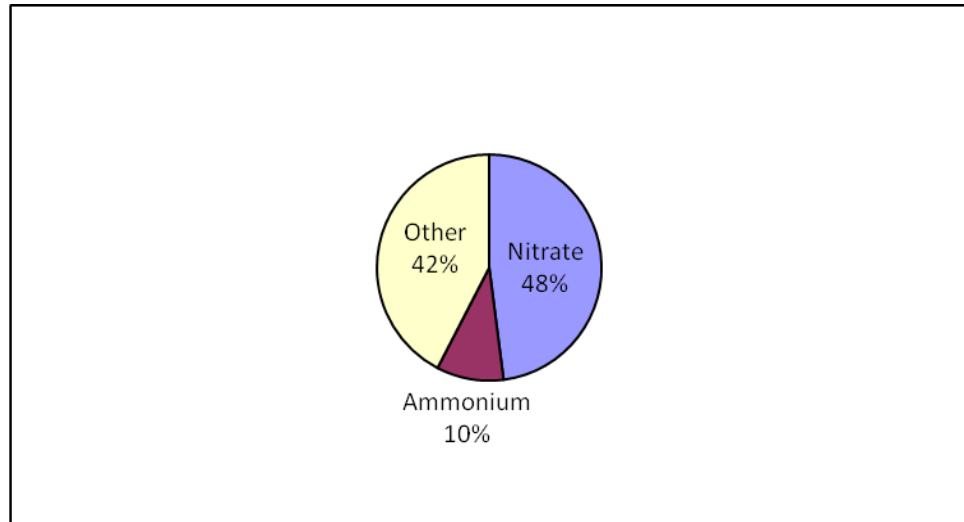
**Figure E-28.** Relative Contributions of Wet and Dry Deposition to the Total Nitrogen Deposition in the Vicinity of Bay Checkerspot Butterfly Habitat





The simulated contribution of various species to total nitrogen deposition in the vicinity of the habitats is summarized in Figure E-29. Nearly half of the deposition is from nitrate (including both particulate nitrate and nitric acid) with about 10% from ammonium. The remainder comes from other nitrogen species such as gaseous dry deposition of NO and NO<sub>2</sub>.

**Figure E-29.** Simulated Contributions of Species to Total Nitrogen Deposition in the Vicinity of Bay Checkerspot Butterfly Habitat



Because this is an episodic simulation, it does not directly provide an estimate of annual total nitrogen deposition. For the episode period (22 days), the simulated nitrogen deposition in the vicinity of the habitats is 0.40 kg-N/ha. In order to compare to other studies, we can scale this to a per annum figure by multiplying by the ratio of the number of days in a year to the 22 days in our simulation. This scaling yields an estimate of 6.6 kg-N/ha/y for the 16 km<sup>2</sup> area around Coyote Ridge. Other modeling estimates of deposition in the area such as *Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity* (Weiss 2006), which conducted CMAQ modeling at 36-km resolution, present annual deposition estimates of a similar magnitude (6 kg-N/ha/y in the South Bay). The annual estimate of 6.6 kg-N/ha/y is also consistent with the estimate made on page 25 (5.9–6.4 kg-N/ha/y) in the section on Gaussian modeling based on current ambient NO<sub>2</sub> concentrations in the San José area. As noted above, the 4-km resolution CMAQ modeling by Tonnesen et al. (2007) showed nitrogen deposition in the range of 7–11 kg-N/ha/y.

## Future-Year Simulations

Projections were made for two future years for simulation with CMAQ: 2035 and 2060. The year 2035 was used because that is farthest out that the Association of Bay Area Governments projects population growth in the study area and the Bay Area. The year 2060 was used as the estimate of the end of the permit term for



the Santa Clara Valley Habitat Plan. The year 2060 thus represents the final “build out” in the study area of urban and rural development covered by the Habitat Plan.

Extrapolations of emissions were made for each of the Bay Area counties, for Santa Clara County minus the study area, for the San José area, and for the study area minus the San José area based on projected population growth. Projected population growth for 2035 for each of the counties and for the San José area (includes the San José sphere of influence) was taken from the Association of Bay Area Governments *Projections 2007: Forecasts for the San Francisco Bay Area to the Year 2035* (Association of Bay Area Governments 2006). Projected population growth for the study area was derived from census tract-level data provided by the Association of Bay Area Governments *Projections 2007* data. Tracts that fell entirely within the study area were fully included, and tracts that fell partially inside the study area were divided proportional to the amount of tract falling within the study area. Population projections for Santa Clara County minus the study area and for the study area minus the San José area were derived by subtraction of the study area population from the total population of Santa Clara County and by subtraction of the San José area from the study area population, respectively. All 2060 populations were calculated by identifying the annual average rate of population change from 2010 to 2035 and extrapolating out to 2060. The assumed growth projections are shown in Table E-23.

**Table E-23.** Growth Factors for Bay Area Counties Used to Extrapolate Emissions to 2035 and 2060

County	2035 Growth Factor	2060 Growth Factor
Alameda	1.34	1.60
Contra Costa	1.37	1.62
Marin	1.14	1.24
Napa	1.25	1.38
San Francisco	1.23	1.42
San Mateo	1.22	1.39
Solano	1.48	1.82
Sonoma	1.24	1.37
Santa Clara County Minus Study Area	1.29	1.50
San José Projection	1.51	1.90
Study Area Minus San José	1.34	1.45
Source for 2035 projections: Association of Bay Area Governments 2006.		

The area and mobile sources within each county were extrapolated. Point source growth was not projected because the supply of increased power demands due to factors such as population growth and increases in industrial activity would not necessarily be distributed proportionally to the increases in population. In addition, point sources were already estimated to be one of the smaller contributors to nitrogen deposition compared to mobile and area sources. Because a detailed emissions inventory outside of the Bay Area was not

available, projections were not made for other areas of the domain. The emissions outside of the Bay Area therefore remain at the base level in the future-year simulations. For this reason, and because the mobile source and area source projections do not take into account improvements in emissions control technologies or regulatory actions, the contributions estimated in this analysis may overestimate the role of local area and local mobile sources in the future. It is not clear whether overestimates of local increases in the total future nitrogen deposition might be offset by underestimates of increases due to sources outside of the Bay Area.

The tags for the future-year simulations were redefined in order to differentiate San José from the remainder of Santa Clara County. The tags used in the future-year simulations are shown below.

**Table E-24.** Tag Definitions for Future-Year (2035 and 2060) Simulations

Tag	Tag Description
Tag 1	Anthropogenic emissions originating in San Mateo County.
Tag 2	Anthropogenic emissions originating in Alameda County.
Tag 3	Anthropogenic emissions originating in Contra Costa County.
Tag 4	Anthropogenic emissions originating in San Francisco County.
Tag 5	Anthropogenic emissions originating in other Bay Area counties (Marin, Napa, Sonoma, and Solano).
Tag 6	Area source emissions originating in San José area.
Tag 7	Mobile source emissions (road and nonroad) originating in San José area.
Tag 8	Point source emissions originating in San José area.
Tag 9	Anthropogenic emissions originating in Santa Clara County minus study area.
Tag 10	Area source emissions originating in (non–San José) study area.
Tag 11	Biogenic emissions originating in Bay Area counties.
Tag 12	Mobile source emissions (road and nonroad) originating in (non–San José) study area.
Tag 13	Point source emissions originating in (non–San José) study area.
Tag 14	Initial and boundary concentrations for the 4-km modeling domain.
Tag 0	Emissions (anthropogenic and biogenic) for rest of the 4-km modeling domain.

The extrapolated future-year emissions are summarized in Tables E-25 and E-26 for 2035 and 2060, respectively.

**Table E-25.** Emissions Summary for 2035 (Average Daily Emissions for the Episode Period)

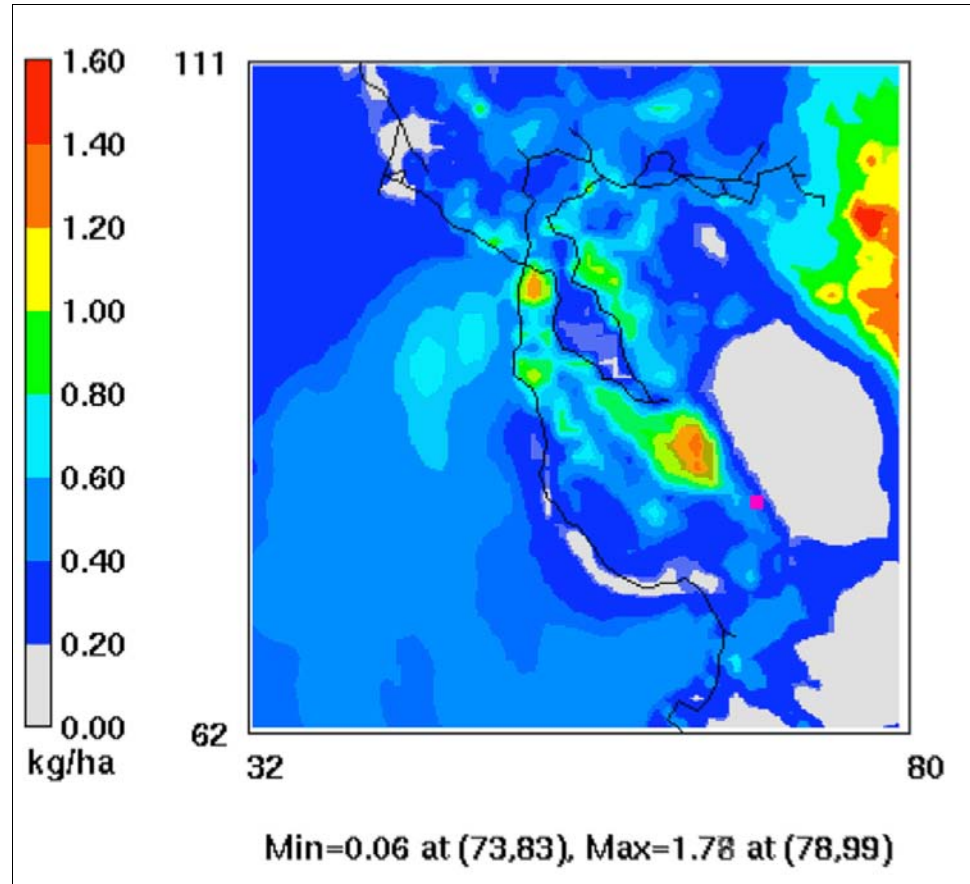
Tag	Tag Description	CO (tpd)	NO <sub>x</sub> (tpd)	VOC (tpd)	NH <sub>3</sub> (tpd)	SO <sub>2</sub> (tpd)	PM2.5 (tpd)	PMC (tpd)
Tag 1	San Mateo County	298.0	86.8	55.2	7.7	14.5	10.9	12.5
Tag 2	Alameda County	648.3	199.0	132.6	14.2	5.3	23.8	29.2
Tag 3	Contra Costa County	541.4	121.9	126.9	13.9	24.1	29.0	22.4
Tag 4	San Francisco County	224.4	66.4	49.9	5.8	6.6	8.1	10.7
Tag 5	Other Bay Area Counties (Marin, Napa, Sonoma, and Solano)	614.1	123.0	169.1	27.4	22.0	32.7	34.0
Tag 6	San José Area Source	29.2	4.5	22.5	3.8	0.1	7.2	11.6
Tag 7	San José Mobile Source	241.4	46.3	26.3	1.6	0.4	1.5	0.5
Tag 8	San José Point Source	2.2	1.3	2.0	1.5	0.1	0.4	0.1
Tag 9	San Clara Non-Study Area	425.6	89.3	82.9	10.0	1.8	13.5	16.0
Tag 10	Non-San José Area Source	19.8	1.1	18.4	2.4	0.1	5.1	8.1
Tag 12	Non-San José Mobile Source	60.9	12.2	7.1	0.4	0.1	0.4	0.1
Tag 13	Non-San José Point Source	0.2	0.3	0.7	2.2	0.0	0.1	0.0
Tag 11	Bay Area 9 Counties Biogenic	28.6	8.9	127.9	0.0	0.0	0.0	0.0
Tag 0	Rest of Domain	8,693.1	1,971.1	1,724.6	569.9	123.5	665.9	1,626.8
<b>Total</b>		<b>11,827.2</b>	<b>2,732.0</b>	<b>2,546.1</b>	<b>660.7</b>	<b>198.6</b>	<b>798.7</b>	<b>1,771.9</b>

**Table E-26.** Emissions Summary for 2060 (Average Daily Emissions for the Episode Period)

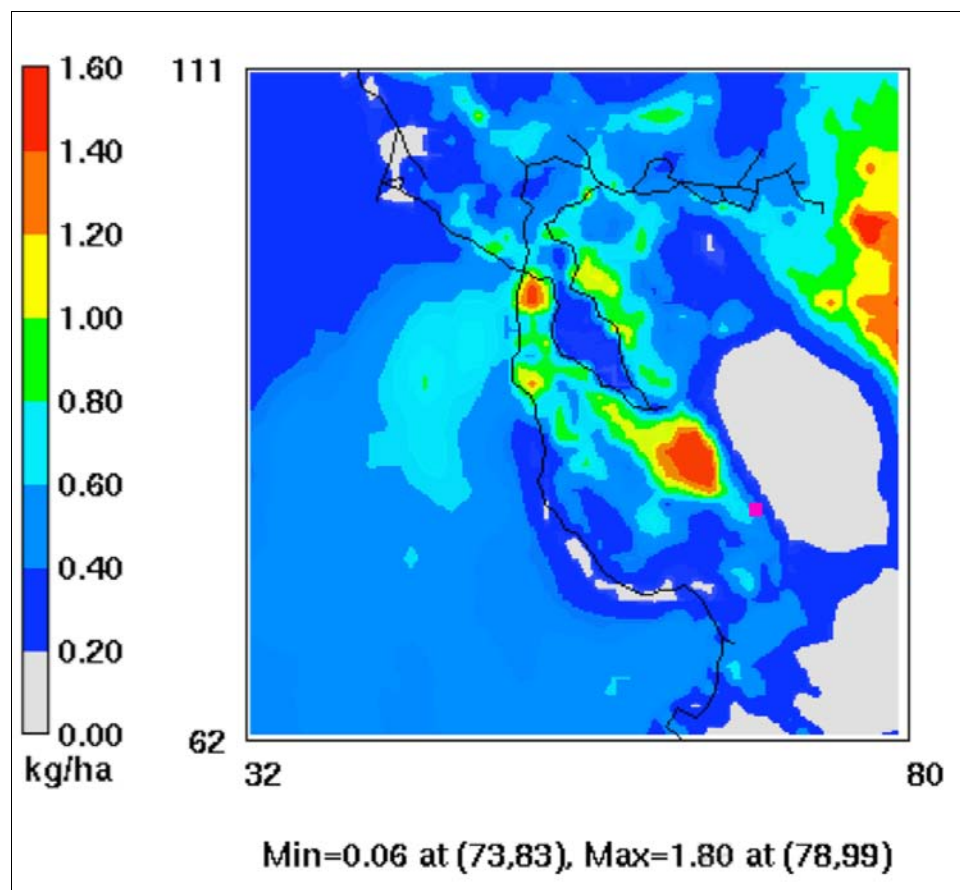
Tag	Tag Description	CO (tpd)	NO <sub>x</sub> (tpd)	VOC (tpd)	NH <sub>3</sub> (tpd)	SO <sub>2</sub> (tpd)	PM2.5 (tpd)	PMC (tpd)
Tag 1	San Mateo County	339.5	98.8	62.5	8.7	16.5	12.3	14.2
Tag 2	Alameda County	770.5	235.9	156.1	16.7	6.1	28.1	34.6
Tag 3	Contra Costa County	638.9	140.9	147.9	16.1	24.5	33.7	26.4
Tag 4	San Francisco County	259.0	76.3	57.4	6.6	7.6	9.3	12.4
Tag 5	Other Bay Area Counties (Marin, Napa, Sonoma, and Solano)	694.4	139.7	190.3	30.5	22.6	36.8	38.9
Tag 6	San José Area Source	36.7	5.6	28.2	4.8	0.2	9.1	14.6
Tag 7	San José Mobile Source	303.1	58.2	33.0	2.0	0.5	1.9	0.6
Tag 8	San José Point Source	2.2	1.3	2.0	1.5	0.1	0.4	0.1
Tag 9	San Clara Non-Study Area	495.4	103.4	96.2	11.3	2.0	15.6	18.6
Tag 10	Non-San José Area Source	21.5	1.2	20.0	2.6	0.1	5.5	8.8
Tag 12	Non-San José Mobile Source	66.1	13.2	7.7	0.4	0.1	0.5	0.1
Tag 13	Non-San José Point Source	0.2	0.3	0.7	2.2	0.0	0.1	0.0
Tag 11	Bay Area 9 Counties Biogenic	28.6	8.9	127.9	0.0	0.0	0.0	0.0
Tag 0	Rest of Domain	8,693.1	1,971.1	1,724.6	569.9	123.5	665.9	1,626.8
<b>Total</b>		<b>12,349.3</b>	<b>2,854.8</b>	<b>2,654.7</b>	<b>673.2</b>	<b>203.7</b>	<b>819.2</b>	<b>1,796.1</b>

The overall simulated nitrogen deposition for the future simulations is displayed in Figure E-30 for 2035 and Figure E-31 for 2060. Note the increases in deposition in the Bay Area counties relative to the base simulation in Figure E-32. Deposition in other portions of the domain is relatively unaffected by the changes in Bay Area emissions.

**Figure E-30.** Simulated Total Nitrogen Deposition (Wet and Dry) for the 22-Day Episode December 17, 2000 through January 7, 2001 Using Bay Area Emissions Extrapolated to 2035



**Figure E-31.** Simulated Total Nitrogen Deposition (Wet and Dry) for the 22-Day Episode December 17, 2000 through January 7, 2001 Using Bay Area Emissions Extrapolated to 2060



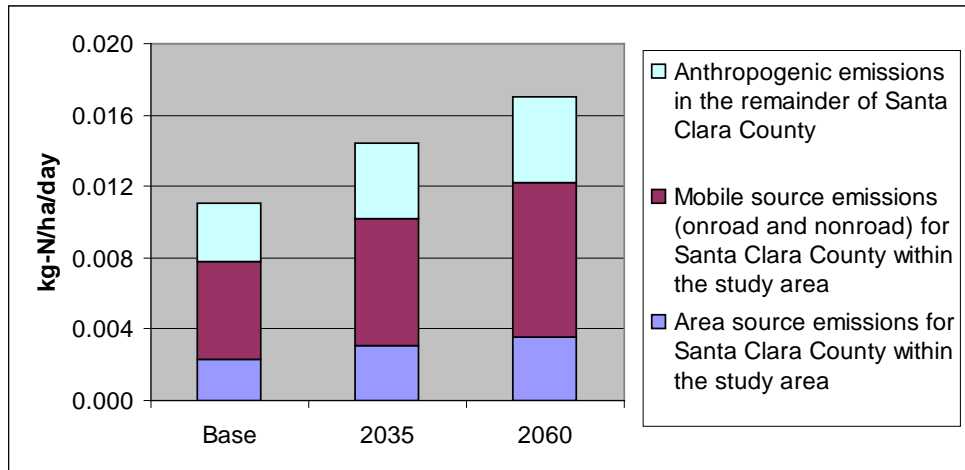
For the episode period (22 days), the simulated nitrogen deposition in the vicinity of the habitats is 0.50 kg-N/ha in the 2035 simulation and 0.58 kg-N/ha in the 2060 simulation. These represent 25% and 45% increases relative to the base year. Scaled to per annum figures, these give 8.3 kg-N/ha/y in 2035 and 9.6 kg-N/ha/y in 2060.

Simulated contributions from the projected source categories in Santa Clara County to deposition are summarized in Figure E-32 for the base year (2005), 2035, and 2060. Deposition from each of the projected categories increases by about 30% in 2035 relative to the base and by about 50% in 2060 relative to the base. These increases are consistent with the extrapolated increases in emissions for these categories of sources. Similarly, the Bay Area counties other than Santa Clara (see Figure E-33) show increases in deposition in proportion to the increases in emissions.

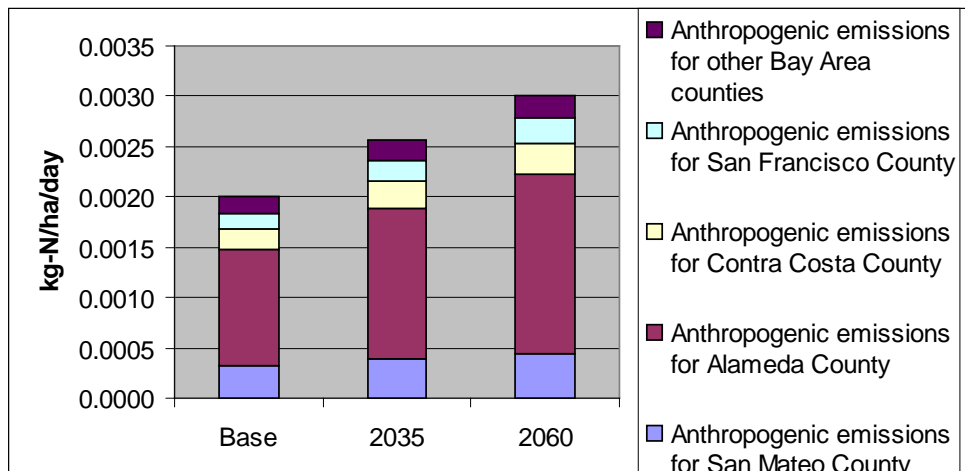
In the base-year simulation, Santa Clara County sources within the study contributed 46% of the nitrogen deposition. This contribution increases to 49% in

2035 and 51% in 2060. The contributions from other Bay Area counties remain at about the same percentages as in the base year, while the percent contribution from sources outside of the Bay Area decreases to about 15% by 2060. Note that no growth was estimated for emissions outside of the Bay Area, so given the increase in Bay Area emissions, the relative contribution from sources outside the Bay Area would go down. It is therefore not known if these other sources would keep pace with the growth in Bay Area counties or not.

**Figure E-32.** Simulated Contributions from Tagged Sources to Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat for the Santa Clara County Emission Categories (kg-N/ha/day)

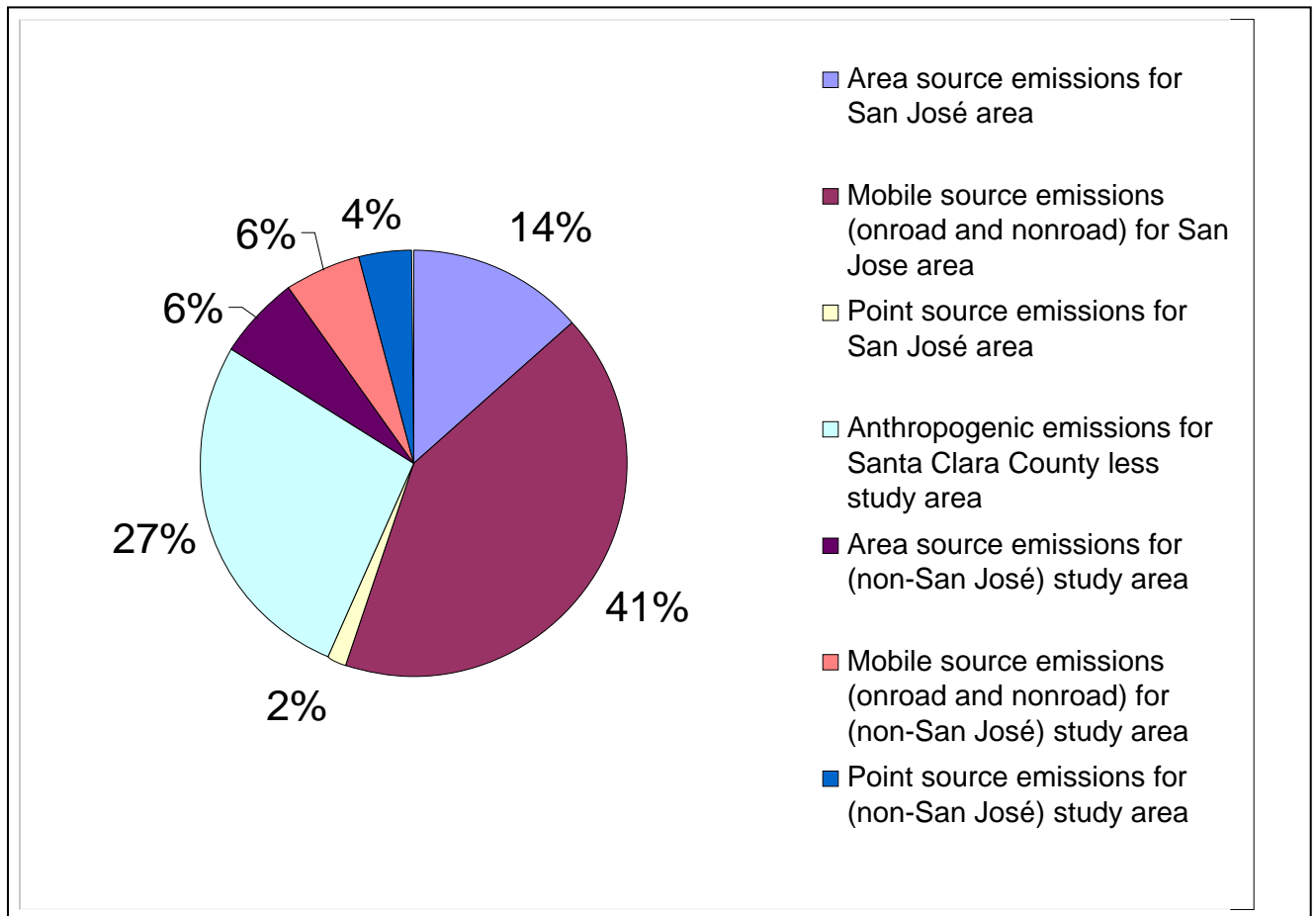


**Figure E-33.** Simulated Contributions from Tagged Sources to Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat for the tagged Bay Area counties (kg-N/ha for the 22-Day Episode Period)



The tags included in the base year simulation did not treat San José sources separately from other sources. In the future-year simulations, tags were added to separate San José emissions from other Santa Clara County emissions within the study area. The simulated contributions of these separate categories of sources are presented in Figure E-34. San José area sources, point sources and mobile sources combined, account for 57% of the nitrogen deposition within the Santa Clara County share of deposition. Of all nitrogen deposition sources (inside and outside Santa Clara County), San José point and mobile sources account for 38% of nitrogen deposition in 2035. Other areas within the study area account for 16% of the nitrogen deposition while the portion of Santa Clara County outside of the study area accounts for 27% of the nitrogen deposition. These relative contributions remain essentially unchanged in the 2060 simulation.

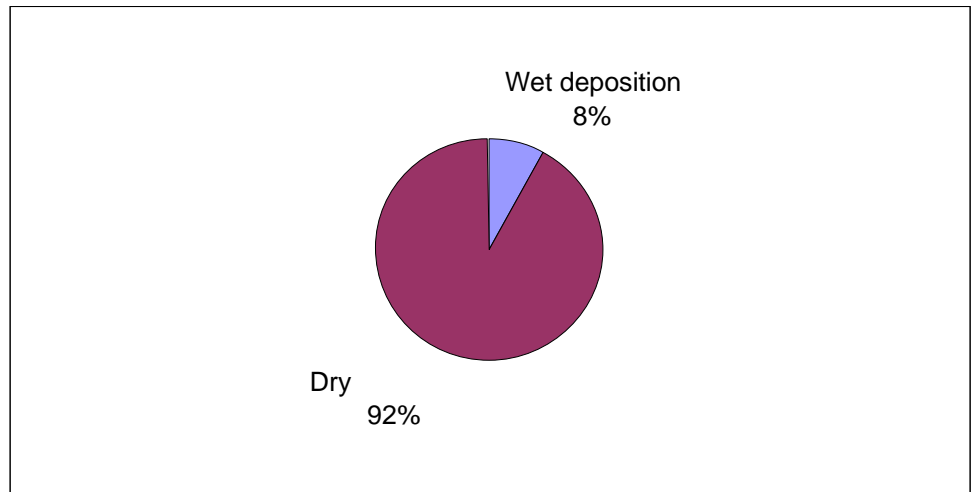
**Figure E-34.** Simulated Relative Contributions from Separate Santa Clara Source Categories to the Santa Clara County Share of Nitrogen Deposition in 2035<sup>6</sup>



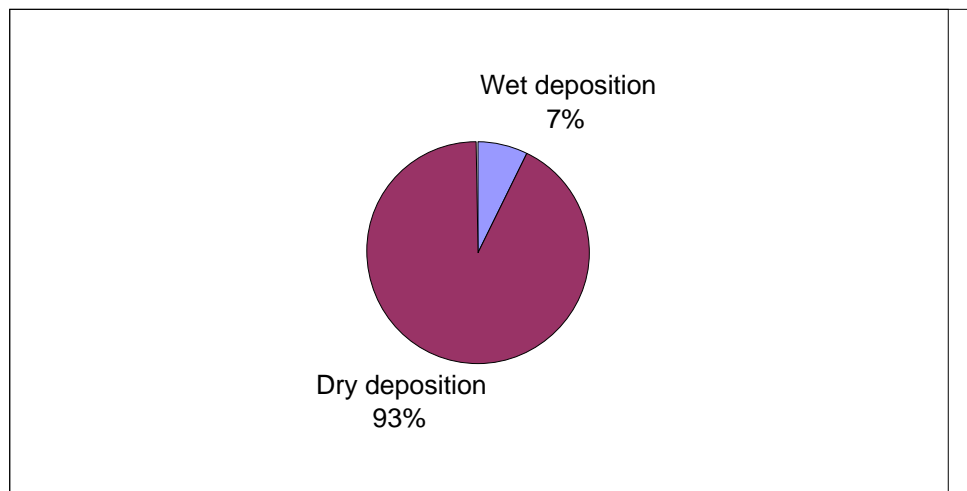
<sup>6</sup> Impacts on nitrogen deposition from Morgan Hill and Gilroy were not explicitly identified in our modeling, but are part of the contribution referred to as the remainder of Santa Clara County. See discussion on p. 68 regarding impacts from these cities.

The relative contribution of wet versus dry deposition and from various species is similar in the future-year simulations relative to the base-year simulations (Figures E-35 through E-38). This is to be expected because the relative contributions of wet and dry deposition is driven by meteorological conditions during the period simulated. The distribution among species in the emissions files would be relatively unchanged in the future-year simulations because emissions of all species were extrapolated based on the same factors.

**Figure E-35.** Relative Contributions of Wet and Dry Deposition to the Total Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat in the 2035 Simulation

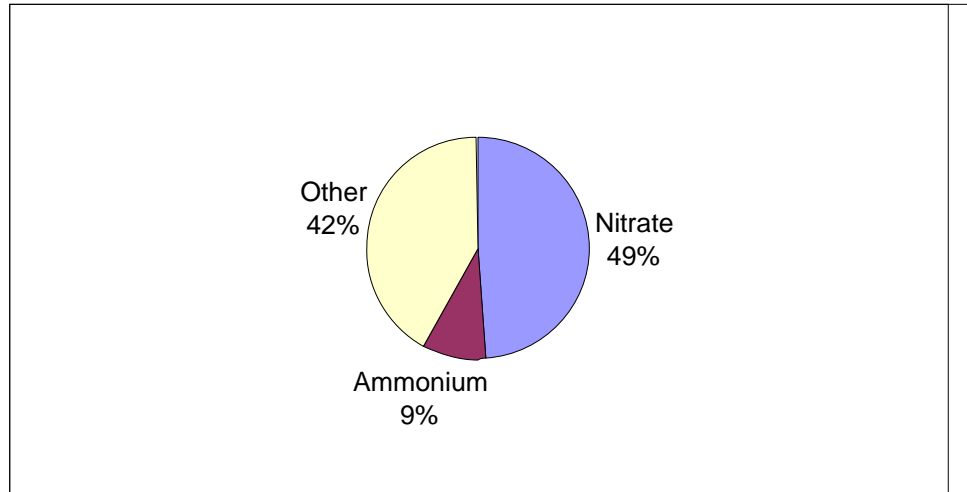


**Figure E-36.** Relative Contributions of Wet and Dry Deposition to the Total Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat in the 2060 Simulation

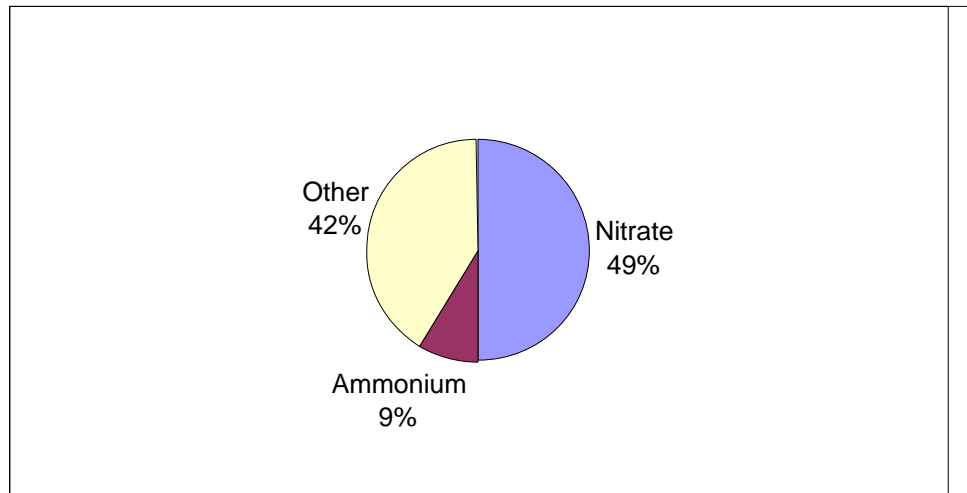




**Figure E-37.** Simulated Contributions of Species to Total Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat in the 2035 Simulation



**Figure E-38.** Simulated Contributions of Species to Total Nitrogen Deposition in the Vicinity of the Santa Clara County Bay Checkerspot Butterfly Habitat in the 2060 Simulation



## Limitations and Uncertainty

Before considering the analytical approaches available to determine the effects of nitrogen deposition, one must understand the uncertainties associated with these methods. The amount and location of nitrogen deposition depends on many factors, which can be difficult to characterize precisely. Rates of nitrogen deposition vary with the location of nitrogen sources and the amount and

chemical form of nitrogen they emit, as well as on meteorological conditions (e.g., prevailing wind direction, precipitation), topography, and vegetation structure. The location, amount, and type of nitrogen emissions in the study area in the future are difficult to predict and characterize because of the complex combination of additional point and mobile emission sources that will result from urban and rural development and road construction under the Habitat Plan. An important example is the uncertainty of additional automobile emissions, which would be the primary source of new nitrogen deposition in the study area as a result of covered activities.

Emissions per vehicle can be expected to decrease over time as technology and emissions standards improve. However, the amount of this reduction is difficult to estimate because technological improvements are uncertain and may have unexpected effects. For example, the introduction of three-way catalytic converters in automobiles has reduced overall emissions of  $\text{NO}_x$ , but has increased emissions of  $\text{NH}_3$ , which has a higher deposition velocity and shorter transport range than  $\text{NO}_x$  (CH2M Hill 2004). The reader must bear in mind that the future year simulations reported here used emissions that were extrapolated from the base year without taking into account the expected improvements in motor vehicle emission control technologies, but also without the postulated, accompanying increase in ammonia emissions.

In addition to the uncertainties associated with the amount of nitrogen deposition that will occur as a result of covered activities, there is uncertainty associated with the degree of impact on covered species. Although it is clear that elevated rates of nitrogen deposition degrade serpentine communities, it is not clear to what extent the incremental addition of nitrogen over current levels will affect these communities and, ultimately, populations of covered species (Weiss 2006).

The CMAQ modeling reported here used a comparatively short time period. However, this time period is fairly representative of the average conditions in the area. In addition, use of a longer time period would not be likely to greatly alter the relative contributions of sources to nitrogen deposition.

The modeling analyses conducted here rely on established models that have been reviewed by the scientific community and evaluated in numerous applications in the past. Nevertheless, the representation of physical and chemical processes in the models can only be as good as current scientific understanding and may include unknown errors or shortcomings. In addition, the models rely on estimates of emissions, meteorological simulations, and limited sets of meteorological measurements as input data. As noted above, these meteorological and emissions estimates include some uncertainty. In this study, however, the model results were not used in an absolute sense to determine nitrogen deposition. Rather, we have used the models in a relative sense to assess the portion of the nitrogen deposition that is attributable to various categories of sources and the relative increase in nitrogen deposition that might be expected due to growth.

## Conclusions

In this study we have used several modeling approaches in order to estimate nitrogen deposition to the Bay checkerspot butterfly habitat area. Deposition based on the line source modeling can only provide estimates of deposition from the highways that were modeled. Estimates based on observed data includes contributions from all sources, but, since the monitors considered are not at habitat locations, the estimates may not be representative for specific habitats. Estimates based on CMAQ include all sources but are averaged over an area that includes both habitat areas and non-habitat areas. Estimates of overall deposition based on observations of NO<sub>2</sub> concentration and modeling using CMAQ both give estimates of total nitrogen deposition of about 6 kg-N/ha/y, which is consistent with other studies such as Weiss (2006). Modeling with CMAQ also provides estimates of expected increases in deposition in future years. Modeling with Gaussian models, while not providing an estimate of overall deposition, provides an estimate of deposition from individual roadways and the expected increases in deposition from those roadways in the future.

Based on the CMAQ modeling, should increases in NO<sub>x</sub> emissions occur in proportion to growth within the study area, within Santa Clara, and within the region, total average nitrogen deposition in the area around and including the habitat areas could increase to 8 kg-N/ha/y in 2035 (a 33% increase) and almost 10 kg-N/ha/y in 2060 (a 66% increase). Gaussian modeling indicates that, when emissions are extrapolated based on projected growth, contributions to nitrogen deposition from major roadways could increase by almost a factor of two by 2030 and by an even larger amount by 2060.

## Contributors to Deposition

The amount that various sources contribute to deposition was assessed with different modeling approaches. The most complete of these methods was the use of the PPTM tagging approach in CMAQ. In addition, however, Gaussian modeling provided estimates of the relative contributions of several major roadways to nitrogen deposition.

## Nitrogen Deposition from Santa Clara Valley Habitat Plan Covered Activities

In the base year, the CMAQ PPTM simulation attributes 30% of the total nitrogen deposition to mobile sources within the study area. Another 16% of the nitrogen deposition comes from stationary sources in the study area. Therefore, 46% of nitrogen deposition on the habitat areas comes from existing development and traffic generated locally within the study area. The remainder of Santa Clara County contributes 17% of the nitrogen deposition while the other eight Bay Area counties account for about 11% of the deposition.

The CMAQ simulation indicates that the remaining 26% of the N-deposition comes from anthropogenic emissions in the remainder of the modeling domain (i.e., most of the remainder of California other than Bay Area counties and a portion of Nevada), initial and boundary concentrations (i.e., effects from outside of the modeling domain), and biogenic emissions within the Bay Area counties.

Impacts on nitrogen deposition from Morgan Hill and Gilroy were not explicitly identified in our modeling, but are part of the contribution referred to as the remainder of Santa Clara County. In the emissions inventory used to prepare emissions for CMAQ, municipalities are not identified separately from the county in which they are located. Estimates of emissions for Morgan Hill and Gilroy were made based on the overlap of boundaries of these cities with grid cells in the modeling domain (see Table E-27). Since grid cells resolve emissions only to areas measuring 144 km<sup>2</sup>, this is necessarily an approximation. However, based on these estimates, the values in Table E-27 indicate that Gilroy contributes 2% of the Santa Clara County NO<sub>x</sub> emissions, Morgan Hill contributes 3%, San José contributes 79%, and the remainder of Santa Clara County contributes the remainder of the NO<sub>x</sub> emissions (16%). It is reasonable to assume that the impacts from Gilroy and Morgan Hill would be roughly in proportion to their emissions. Of the 17% contribution to nitrogen deposition noted for the remainder of Santa Clara County, therefore, we could expect Gilroy to make up about 1.5% (9% of 17%) and Morgan Hill to make up about 2.7% (16% of 17%).

**Table E-27.** Estimated NO<sub>x</sub> Emissions for Cities in Santa Clara County

City or Area	NO <sub>x</sub> Emissions (tpd)	Santa Clara NO <sub>x</sub> Emissions (%)	Non-San José NO <sub>x</sub> Emissions (%)
San José	52.07	79	
Gilroy	1.20	2	9
Morgan Hill	2.20	3	16
Santa Clara County, other than above	10.20	16	75
<b>Total</b>	<b>65.68</b>		

Increases in nitrogen deposition based on extrapolation of emissions to future years were simulated for Bay Area counties. Future-year emissions projections were not available for the remainder of the domain. The simulated nitrogen deposition in the area around and including the Bay checkerspot butterfly habitats (once scaled to per annum values) is 8.3 kg-N/ha/y in 2035 and 9.6 kg-N/ha/y in 2060, a 25% and 45% increases relative to the base year, respectively.

Contribution of mobile source emissions in the Bay checkerspot butterfly habitat areas are estimated to increase by about 0.6 kg-N/ha/y in 2035 over the base year (a 10% increase) and by another 0.5 kg-N/ha/y in 2060 (an 18% increase). The

San José contribution to nitrogen deposition in the habitat areas is estimated to be 38% in 2035.

Gaussian modeling of major roadways near the habitats indicates an increase in nitrogen deposition of about 0.25 kg-N/ha/y using emissions extrapolated to 2030 over the base year (a 4% increase in total deposition). The increase using emissions extrapolated to 2060 relative to 2030 could be from 0.4 kg-N/ha/y to more than 1 kg-N/ha/y depending on location (a 7% to 17% increase in total deposition).

## **Nitrogen Deposition from Outside Growth**

Only growth in emissions in Bay Area counties was considered in the CMAQ PPTM simulations because future-year emissions were not available for the remainder of the modeling domain. Gaussian modeling was limited to an area in the immediate vicinity of the habitats due to the limitations in scale of this type of model.

The contribution of emissions outside of the study area but within Santa Clara County are estimated to grow from 1.1 kg-N/ha/y in the base year to 1.5 kg-N/ha/y based on emissions extrapolated to 2035 (36% increase) and 1.7 kg-N/ha/y based on emissions extrapolated to 2060 (55% increase). The contribution of emissions from all other Bay Area counties are estimated to grow from 0.7 kg-N/ha/y in the base year to 0.9 kg-N/ha/y in 2035 (29% increase) and 1.0 kg-N/ha/y in 2060 (43% increase).

## **Effects of Nitrogen Deposition**

### **Effects on Serpentine Grassland**

The major effect of N-deposition on serpentine grassland is to promote invasion of nonnative annual grasses in the absence of grazing (Weiss 1999). Additional studies have been done since Weiss's study and are included in the Metcalf Energy Center Annual Monitoring reports (CH2M Hill 2002–2008), monitoring reports for the VTA mitigation lands (Harvey and Associates 2007), and USFWS funded research on Adaptive Management of Serpentine Grasslands in Santa Clara County (Weiss et al. 2007).

The effect is illustrated in the photo below (Figure E-39), taken in 1995 at the base of Coyote Ridge, just north of the Kirby Canyon Landfill. The right side of the fence was grazed, and the left side was ungrazed for 9 years (since 1986). Similar invasions have been noted and documented in the Silver Creek Hills, Tulare Hill, Santa Teresa County Park, and other sites (including small experimental plots).

The invasion occurs rapidly. Annual grasses build up over two to three years, eventually developing a thick layer of thatch that effectively smothers the native forbs. Native species cover and richness plummet across all but the thinnest soils. The major invasive grass species include Italian ryegrass (*Lolium multiflorum*) and soft brome (*Bromus hordeaceus*), with localized stands of common barley (*Hordeum*) spp. and compact brome (*Bromus madritensis*).

It is likely that invasions of barb goatgrass (*Aegilops triuncialis*) into serpentine soils are enhanced by N-deposition, but this species will invade serpentine soils in the absence of N-deposition.

Grazing management is essential. Grazing cattle select N-rich annual grasses and create bare soils that favor annual forbs. The existing grazing systems, documented elsewhere in the Habitat Plan and other management plans, have served well to maintain native diversity of serpentine grasslands. Typical stocking rates and seasonality include 1 cow-calf per 10–15 acres for winter-spring (rainy season) or summer-fall (dry season), with small modifications according to short-term seasonal variations. Cattle are moved from pastures that no longer supply enough grass to maintain cattle weight. Cattle can also keep barb goatgrass from completely dominating serpentine grassland if grazing occurs before the awns harden but after the other annual grasses have dried out.

Recovery with the reintroduction of grazing may take many years, as evidenced in the Silver Creek Hills (Wetlands Research Associates 2008). On Tulare Hill, Weiss and colleagues have noted that seedbanks from the final large cohort of native forbs in 2004 (3 years after the cessation of grazing) provided for dense native forb cover following a June 2004 fire on Tulare Hill (Metcalf Energy Center 2006). Once the native seedbank is depleted, restoration of high-quality serpentine grassland requires recolonization from forb-rich patches of thin soils, which is a much slower process.

The long-term effects of N-deposition are unknown, but the working hypothesis is that existing grazing regimes will be able to maintain diversity. However, recent research suggests that current levels of grazing may not be effective at maintaining native biological diversity or reducing invasive grass impacts under on-going nitrogen accumulation in serpentine grasslands (J. Pasari, pers. comm.).

It is estimated from roadside gradient studies at Edgewood that the critical load for intense grass invasions is on the order of 5 kg-N/ha/y (Weiss et al. in preparation). This level will likely be exceeded for several decades in Santa Clara County (where similar passive sampler methods estimate 10–20 kg-N/ha/y), with the higher levels in hotspots near freeways and urban fringe (Fenn et al. 2010).

**Figure E-39.** Invasion of Non-Native Annual Grasses due to Nitrogen Deposition at Coyote Ridge



## Effects on Bay Checkerspot Butterfly

Dense stands of dotseed plantain (*Plantago erecta*) across many slopes and soil depths is an essential condition for Bay checkerspot butterfly populations. Loss of host plants and nectar sources due to grass invasions leads to rapid declines and eventual local extinction of populations. Numbers in the Silver Creek Hills rapidly declined from tens of thousands to near extinction over a 3-year period (Weiss 1999). A population of 1,000–2,000 butterflies on Tulare Hill in 2002 dropped following cessation of grazing in 2001 over two-thirds of the hill and reduced the number of checkerspot to a tiny remnant population (1 adult sighted in each of the three years from 2006 through 2008).

## Effects on Serpentine Covered Plants

The main effect on covered plants to consider is their vulnerability to annual grass overgrowth. Brief assessments of these effects on covered plants are discussed below.

Santa Clara Valley dudleya (*Dudleya setchellii*) lives on rock outcrops and is relatively immune from grass invasions except when extremely tall grasses smother small rock outcrops. The species persists on medium to large rock outcrops in ungrazed areas (Weiss et al. 2008).

Metcalf Canyon jewelflower and most beautiful jewelflower (both subspecies of covered *Streptanthus albidus*) can be poor competitors against dense annual grasses (Green 2005), and some degree of grazing appears necessary to maintain populations. The two known populations of Tiburon paintbrush (*Castilleja affinis neglecta*) persist in grazed areas but likely would get overrun by dense grass growth if grazing were removed.

Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*) is a perennial that dominates serpentine seeps and persists in both grazed and ungrazed drainages. The annual grasses do not readily invade the active stream channels and the plant thrives in a variety of grazing regimes. Cattle avoid the sharp-spined leaves, but the physical disturbance in wet soils appears to encourage thistle recruitment.

Smooth lessingia (*Lessingia micradenia* var. *glabrata*) may be vulnerable to grass invasions but may have different dynamics because of its late-season (summer-fall) flowering.

Coyote ceanothus (*Ceanothus ferrisae*) is itself a nitrogen fixer and once established, is able to compete well with annual grasses. Fragrant fritillary (*Fritillaria liliacea*) is vulnerable to overgrowth by annual grasses but may persist as a bulb or vegetative state for many years before going locally extinct.

## Effects on Other Natural Communities

The effects of N-deposition on non-serpentine annual grasslands and the grassland understory of oak woodlands are similar to those on serpentine grassland—increased annual grass growth displaces native forbs. Non-serpentine annual grasslands and oak woodlands in the study are extensive (310,875 acres, or 60% of the study area), so these adverse effects could be widespread. Vernal pools appear to be particularly susceptible to overgrowth by grasses (Marty 2005), although vernal pool habitats have largely disappeared from the study area. Increased grass growth also increases fuel loads and subsequent fire intensity. Other grassland weeds such as yellow star thistle likely react positively to increased N-availability, since weeds have high growth potential and can rapidly respond to increased nutrient availability. Growth and spread of weeds are major issues for biodiversity conservation.

Appropriate grazing management to control annual grass biomass is necessary in these habitats. Increased weed management costs are likely for those weeds that cannot be controlled by grazing.

Long-term effects on shrublands, denser woodlands, and forests have not been locally observed, but these habitats should be more resistant to effects of N-deposition than are grasslands. Increased grass growth in sparse shrublands can change fire frequency and lead to conversion to annual grassland following short-interval fires. However, all ecosystems can be subject to N-saturation given long-term deposition loads, with the results being increased rates of N-cycling leading



to leaching of nitrate, gaseous emissions of NO, nutrient imbalances, and changes in composition as more nitrophilous species gain competitive advantage.

The leaching of nitrate from N-saturated systems may have impacts on local aquatic systems, but have not been studied in depth. For example, the Llagas aquifer and Llagas Creek are under a set of nitrate Total Maximum Daily Load (TMDL) limits. Initial calculations by Weiss (2008) using the 4 km CMAQ run (Tonnesen et al. 2007) suggest that total atmospheric N-deposition directly on the Llagas Basin (the Santa Clara Valley floor from Cochrane Road south, not including tributary streams) is similar to agricultural N-fertilizer inputs (150 vs. 120 tons/year). However, no direct links have been made at present and further research is needed.

## Effects on Water Quality

Water quality effects have not been studied in the region, but high nitrate has been observed in high deposition watersheds (20–50 kg-N/ha/y) in the Los Angeles basin (Fenn et al. 2003).

## List of Preparers

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## References

### Printed References

Association of Bay Area Governments. 2006. *Projections 2007: Forecasts for the San Francisco Bay Area to the Year 2035*. December 2006.

Bay Area Air Quality Management District. 2011. *Base Year 2008 Bay Area Emissions Inventory Summary Report*. San Francisco, CA. Available:

- <<http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/Emission%20Inventory/BY08SummaryReportFinal.ashx>>. Accessed: April 27, 2012
- Buhr, M., E. Shields, E. Simon, S. Reid. 2005. *Examination of Reactive Nitrogen Partitioning at the Bakersfield and Angiola Field Sites*. (Tech. memo. STI-902322-2652-TM2). Sonoma Technology, Inc.
- CH2M Hill. 2000. *Impacts Analysis for Metcalf Energy Center*. February. Prepared for Calpine/Bechtel. San José, CA.
- . 2004. Annual Monitoring Report For The Metcalf Energy Center Ecological Preserve, Santa Clara County, California: Year 2-Initial Baseline Monitoring. March. Prepared for the Land Trust for Santa Clara County.
- CH2M Hill and S.B. Weiss. 2002–2008. Annual Monitoring Report for Metcalf Energy Center Ecological Preserve and Los Esteros Critical Energy Facility. Prepared for the Silicon Valley Land Conservancy (San José, CA).
- City of San José. 2007. *Draft Environmental Impact Report for the Coyote Valley Specific Plan*. March. Prepared by David J. Powers and Associates. Available: <[http://www.sanjoseca.gov/coyotevalley/publications\\_DEIR.htm](http://www.sanjoseca.gov/coyotevalley/publications_DEIR.htm)>. Accessed: April 10, 2007.
- Davis, F., S. B. Weiss, and G. Tonnesen. 2003. Assessment of Nitrogen Deposition: Modeling and Habitat Assessment, Scope of Work, Sep. 1, 2003–Aug. 31, 2004, A Research Proposal to the California Energy Commission. June 10, 2003. Available: <[http://pah.cert.ucr.edu/aqm/ndep/docs/CEC-UCR\\_Proposal.102003l.pdf](http://pah.cert.ucr.edu/aqm/ndep/docs/CEC-UCR_Proposal.102003l.pdf)>.
- Fenn M. E., E. B. Allen, S. B. Weiss, S. Jovan, L. H. Geiser, G. S. Tonnesen, R. F. Johnson, L. E. Rao, B. S. Gimeno, F. Yuani, T. Meixner, and A. Bytnerowicz. 2010. Nitrogen critical loads and management alternatives for N-impacted ecosystems in California. *Journal of Environmental Management* 91 (2010) 2404–2423
- Fenn, M. E., J. S. Baron, et al. 2003. “Ecological Effects of Nitrogen Deposition in the Western United States.” *Bioscience* 53: 404–420.
- Gery, M.W. and R.R. Crouse. “User's Guide for Executing OZIPR.” Atmospheric Research Associates, Inc. Available: [http://www.epa.gov/scram001/dispersion\\_alt.htm#ozipr](http://www.epa.gov/scram001/dispersion_alt.htm#ozipr)<[http://www.epa.gov/scram001/dispersion\\_alt.htm#ozipr](http://www.epa.gov/scram001/dispersion_alt.htm#ozipr)>
- Green, A.R. 2005. Effects of Exotic Species and Soil Type on a Rare Annual Jewelflower (*Streptanthus albidus* var. *peramoenus*) in Santa Clara County, CA MS Thesis, San José State University

- Harvey and Associates and Creekside Center for Earth Observation. 2007. VTA-Coyote Ridge Property Year 1 (2007) Monitoring Report. Prepared for Santa Clara County Open Space Authority.
- Marty, J. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Conservation Biology* 19(5):1626-1632.
- Metcalf Energy Center. 2006. *Air Quality Monitoring Results*. June. Available: <[http://www.metcalfenergycenter.com/air/Calpine\\_June\\_2006\\_Data.pdf](http://www.metcalfenergycenter.com/air/Calpine_June_2006_Data.pdf)>.
- State of California. 2006. *2006 Traffic Volumes on the California State Highway System*. Business, Transportation and Housing Agency, Department of Transportation, Division of Traffic Operations, Sacramento, CA 94274.
- Tonnesen, G., Z. Wang, M. Omary, and C. J. Chien. 2007. *Assessment of Nitrogen Deposition: Modeling and Habitat Assessment*. (CEC-500-2006-032.) California Energy Commission, PIER Energy-Related Environmental Research.
- U.S. Environmental Protection Agency. 2002. National Emissions Inventory. Available: <<http://www.epa.gov/ttn/chief/net/>>.
- U.S. Fish and Wildlife Service. 2001. *Biological Opinion on the Coyote Valley Research Park and Four Other Related Developments*. July. Sacramento, CA.
- Weiss, S. B. 1999. Cars, cows, and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13(6):1476-1486.
- . 2006. *Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity*. (CEC-500-2005-165.) California Energy Commission, PIER Energy-Related Environmental Research.
- . 2008. *Atmospheric Nitrogen Deposition in the Santa Clara Valley. Report to the Loma Prieta Resource Conservation District*, Gilroy, CA.
- Weiss, Stuart B., Wright, David H., and Niederer, Christal. 2007. *Serpentine Vegetation Management Final Report*. USFWS, Sacramento, CA.
- Weiss, S.B., and Bytnerowicz, A. In preparation. Catalytic converters and checkerspot butterflies: local population extinction driven by vehicular ammonia emissions. For *Environmental Pollution*.
- Wetlands Research Associates. 2008. *Ranch at Silver Creek Annual Monitoring Report*. Wetland Research Associates, San Rafael, CA prepared for Ranch at Silver Creek.

## Personal Communications

Allen, Edith. Professor of Plant Ecology, UC Riverside. 2006. Email communication to City of San José planner regarding nitrogen deposition in Santa Clara Valley and its effect on serpentine communities.

Ballanti, Don. Certified consulting meteorologist. 2006. Email communication to City of San José planner regarding nitrogen deposition in Santa Clara Valley.

Ma, Paul. City of San José, Department of Transportation. 2008. Email communication to T. Myers regarding traffic levels on Santa Clara County roadways—November 20, 2008.

Nagano, Chris. Staff member, U.S. Fish and Wildlife Service. 2007. Email to WRA regarding regional analysis methodology for nitrogen deposition impacts from development.

Pasari, Jae. Ph.D. candidate, UC Santa Cruz. 2011. Response to comment letter submitted to Cori Mustin and Kenneth Schreiber on the Draft Habitat Plan—April 15, 2011.



Appendix F

# **Climate Change and the Santa Clara Valley Habitat Plan**



## Appendix F

# Climate Change and the Santa Clara Valley Habitat Plan

Climate change is defined as any significant change in climate metrics, including temperature, precipitation, and wind patterns, over a period of time. Climate change—broadly speaking—may result from natural or human activities that change atmospheric composition. There is now broad scientific consensus that humans are changing the chemical composition of the earth’s atmosphere. Activities such as fossil-fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of greenhouse gases (GHGs) such as carbon dioxide (CO<sub>2</sub>) in the atmosphere. An increase in GHG emissions is said to result in an increase in the earth’s average surface temperature, commonly referred to as *global warming*. Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, and other climatic conditions; such changes, taken collectively, are commonly referred to as *climate change*. Because climate change is predicted to have potential adverse effects on the natural environment, the effects of climate change in the context of the Santa Clara Valley Habitat Plan (Plan) are discussed in this appendix.

## Regulatory Context

To date there have been no significant environmental regulations enacted in the United States at the national level specifically designed to address climate change. However, several federal and state court decisions and pending cases anticipate the need for addressing climate change in future regulatory processes as a “changed circumstance.” Recent case law suggests that plan developers ignore climate change at their peril. In *Massachusetts v. Environmental Protection Agency* (2007), the Supreme Court sided with the petitioners, upholding that the potential threats of carbon dioxide (CO<sub>2</sub>) are sufficiently understood and should be regulated by the Clean Air Act, despite scientific uncertainty. Similarly, in *Natural Resources Defense Council v. Kempthorne* (2007), the courts contended that the uncertainty associated with climate change was not a reason to fail to address it in the context of a Biological Opinion under Section 7 of the federal Endangered Species Act (ESA) (Bernazzani et al. 2012).



In addition, some state and federal regulations and policies provide a framework within which climate change can be addressed. Below is a summary of these regulations and policies.

## **Endangered Species Act and No Surprises Policy**

Habitat Conservation Plans (HCPs) are required to address any changed circumstances that are reasonably foreseeable within the HCP permit term (63 Federal Register [FR] 35, February 23, 1998). Changed circumstances are defined by the U.S. Fish and Wildlife Service (USFWS) in the No Surprises Policy (63 FR 35, February 23, 1998) as “changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for.” The No Surprises policy ensures that no additional land-use restrictions or financial compensation will be required of the permit holder as long as the plan is being properly implemented.

## **Natural Community Conservation Planning (NCCP) Program**

Like the ESA, the Natural Community Conservation Planning (NCCP) program is tasked with sustaining species and their habitat and maintaining viability of listed species. The NCCP Act is broader in its orientation and objectives than both its federal counterpart and the California Endangered Species Act. The NCCP Act includes provisions to contribute to the recovery of listed species and to specifically address natural communities and ecological processes.

“Changed circumstances” are also a component of NCCPs and are defined by the NCCP Act as “reasonably foreseeable circumstances that could affect a Covered Species or geographic area covered by the plan.” Accordingly, an NCCP must “incorporate a range of environmental gradients (such as slope, elevation, aspect, and coastal or inland characteristics) and high habitat diversity to provide for shifting species distributions due to changed circumstances.” [Section 2820(a)(4)(D)].

Prior to 2010, approved HCPs or NCCPs did not typically address climate change as a changed circumstance (Bernazzani et al. 2012). However, as general scientific consensus emerges regarding human-induced changes to the atmosphere, it can be assumed that climate change is now “reasonably anticipated” and must therefore be addressed along with measures that would be taken by the Permittees to respond to those changes. USFWS regulations require that HCPs and NCCPs take potential “changed circumstances” into account in the Plan, along with measures to address these changed circumstances.

## California Assembly Bill 32

In 2006, the State of California passed into law the Global Warming Solutions Act of 2006, commonly referred to as Assembly Bill 32 (AB 32), which is designed to significantly reduce short- and long-term greenhouse gas emissions generated by California. AB 32 states that global warming poses a serious threat to the environment of California.

## Guidance

Over the past decade, there has been a growing recognition at national, state, and local levels of the need to consider climate change in natural resource management and conservation planning. Nationally, federal agencies such as the USFWS, Government Accountability Office (GAO), the U.S. Global Change Research Program (GCRP), and the U.S. Environmental Protection Agency (EPA) have released reports calling for natural resource management that increases the resilience of ecological resources to climate change (Global Change Research Program 2009; U.S. Environmental Protection Agency 2009). Resilience refers to the amount of change or disturbance that an ecological system can absorb without undergoing a fundamental shift to a different set of structures and functions (Julius et al. 2008). A fundamental goal of climate change adaptation is to reduce the risk of adverse environmental outcomes by increasing the resilience of ecological systems.

In 2009, Congress asked the White House Council on Environmental Quality (CEQ) and the U.S. Department of the Interior (DOI) to develop a national strategy for helping the nation's natural resources adapt to climate change. This draft strategy, released in January 2012 (Council on Environmental Quality and U.S. Department of the Interior 2012), is the first joint federal, state, and tribal effort to identify adaptation strategies. It identifies some of the key actions that agencies should consider implementing over the next five to ten years.

Even prior to the release of federal guidance, the State of California developed its *Climate Adaptation Strategy*, which focuses on a multi-sector approach to respond to the current and future impacts of climate change. California was one of the first states to pursue a multi-sector state wide adaptation strategy and many of the objectives are being implemented today. The California Department of Fish and Game (CDFG) has created a Climate Science and Renewable Energy Branch with a climate science program that specifically works to plan for and respond to the effects of climate change on the state's fish and wildlife and their habitats. In September 2011, the CDFG released their vision for confronting climate change in California, which highlights an approach centered around 1) Unity: creating and maintaining vital climate change partnerships and collaborations, 2) Integration: integrating climate change into CDFG activities, and 3) Action: meeting conservation objectives for maintaining healthy ecosystems while taking into account climate change threats and impacts. In addition, within this vision the CDFG has detailed multiple mechanisms for incorporating climate change into natural resource planning, including national,

regional and local coordination, particularly around Landscape Conservation Cooperatives; California's Wildlife Action Plan; and the NCCP program. The NCCP program is one of the few existing planning programs put into law that addresses climate change adaptation.

## Observed Climate Change

The Earth's climate varies naturally over many temporal and spatial scales as a result of meteorological processes such as changes in atmospheric circulation patterns. *Climate variability* refers to deviations from the average climate, whereas *climate change* refers to changes in the long-term average, generally based on averages of twenty to thirty years.

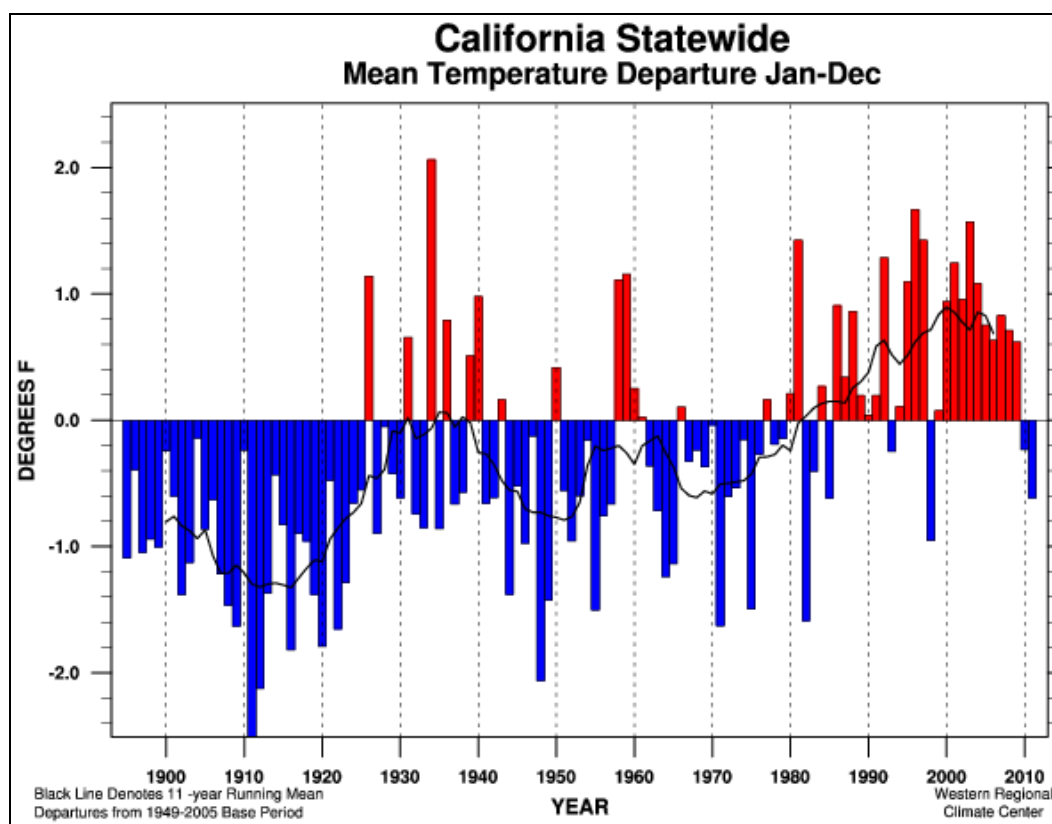
Climate change is occurring as a result of high concentrations of greenhouse gases in the Earth's atmosphere (National Research Council 2010; Intergovernmental Panel on Climate Change 2007). Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, and ozone. These gases absorb energy emitted by the Earth's surface, and then re-emit some of this energy back to Earth, warming the Earth's surface, and influencing global and local climates. As more and more greenhouse gases are emitted into the atmosphere from human activities such as the burning of fossil fuels, the Earth's energy balance is disrupted, resulting in a number of changes to the historical climate. Evidence of long-term changes in climate over the twentieth century includes the following (Intergovernmental Panel on Climate Change 2007; National Research Council 2010; Global Change Research Program 2009):

- An increase of 0.74 degree Celsius (°C) (1.3 degrees Fahrenheit [°F]) in the Earth's global average surface temperature;
- An increase of 0.17 meter (6.7 inches) in the global average sea level;
- A decrease in arctic sea-ice cover at a rate of approximately 4.1% per decade since 1979, with faster decreases of 7.4% per decade in summer;
- Decreases in the extent and volume of mountain glaciers and snow cover;
- A shift to higher altitudes and latitudes of cold-dependent habitats;
- Longer growing seasons; and
- More frequent weather extremes such as droughts, floods, severe storms, and heat waves.

# Observed Climate Change in California

## Temperature

The western United States has warmed at a faster rate compared to the national average (Moser et al. 2009). From 1949–2005, California's average annual mean temperature was approximately 12°C (56°F). Over the twentieth century, California has experienced an increase in this average of roughly 0.8°C (1.5°F), with some variability in the rate of warming within the state (see Figure F-1).<sup>1</sup> The warming trends are asymmetrical, with nighttime minimum temperatures rising faster than daytime maximum temperatures, and winter/spring seasonal temperatures experiencing greater warming compared to summer/fall (Nemani et al. 2010; Gershunov et al. 2009). Some locations within California are no longer frozen at night during winter (Moser et al. 2009).



Source: Abatzoglou et al. 2009.

Data downloaded from: <<http://www.wrcc.dri.edu/monitor/cal-mon/index.html>>.

**Figure F-1.** Change in Annual Mean Temperature (°F) for California for the Twentieth Century Relative to 1949–2005 Baseline

<sup>1</sup> The Western Regional Climate Center provides monthly, seasonal, and annual averages of temperature and precipitation for California and subregions within the state. The monthly station data, taken from cooperative observers (COOP), along with gridded data from the PRISM database, are used to assess climate across the state. Note that a limited number of stations were reporting prior to 1918.

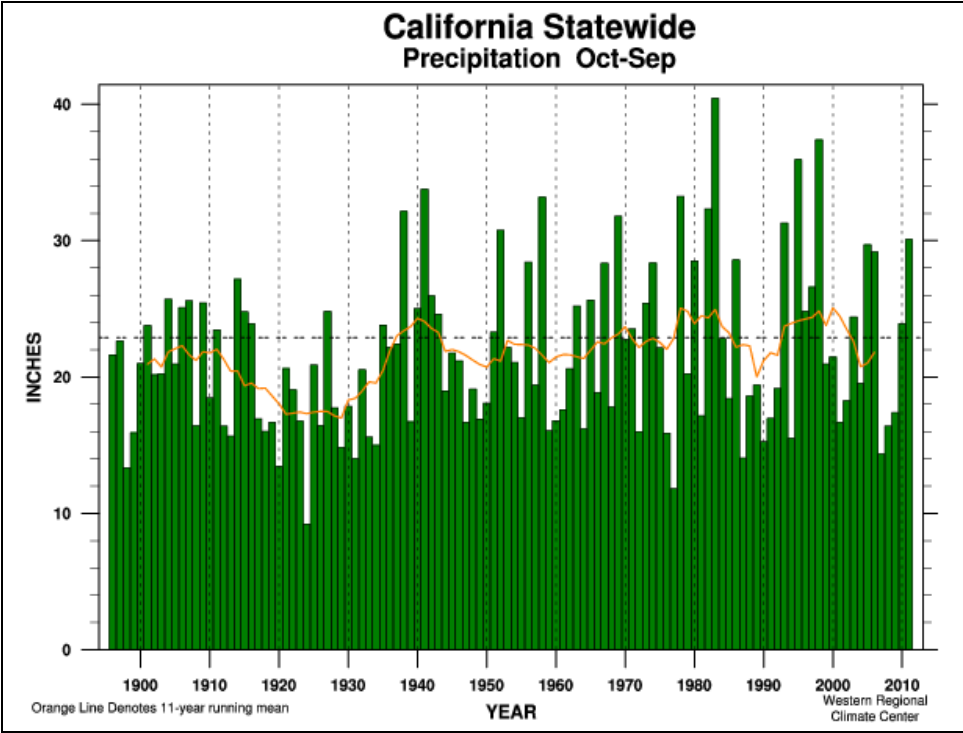
In spring, summer, and fall the pattern of twentieth-century warming has been similar, according to an analysis available from the Western Regional Climate Center presented in **Table F-1** below (Abatzoglou et al. 2009). Across California, spring has been arriving earlier in the year and fall has occurred later (Moser et al. 2009). The frequency of heat waves also has been increasing, and it is generally becoming more humid (Gershunov et al. 2009).

**Table F-1.** Seasonal Temperatures (°F, 1949–2005) and Twentieth Century Trends (Δ°F) for California

Season	Seasonal Temperature (°F, 1949-2005) and Twentieth Century Trends (ΔF, in Parentheses)		
	Minimum Temperature	Maximum Temperature	Mean Temperature
Winter (DJF)	32 (1.4)	53 (1.0)	43 (1.2)
Spring (MAM)	41 (1.8)	66 (1.4)	53 (1.6)
Summer (JJA)	55 (2.6)	86 (0.6)	70 (1.6)
Fall (SON)	44 (2.2)	71 (0.9)	58 (1.5)
Source: Abatzoglou et al. 2009.			
Note: DJF = December, January, February; MAM = March, April, May; JJA = June, July, August; SON = September, October, November.			

## Precipitation

Over the twentieth century, California, however, has experienced a statewide increase in annual precipitation of approximately 3.5 inches (Abatzoglou et al. 2009). Figure 2 shows the year-to-year variability of annual precipitation compared to the 1950–2005 average of 23 inches (indicated by the dashed line). **Table F-2** provides the seasonal precipitation averages and twentieth-century trends.



Source: Abatzoglou et al. 2009.

Data downloaded from: <<http://www.wrcc.dri.edu/monitor/cal-mon/index.html>>.

**Figure F-2.** Annual Precipitation (inches) for California during the Twentieth Century (Water-Year)

**Table F-2.** Seasonal Precipitation Averages (inches, 1949–2005) and Twentieth Century Trends for California (inches, in parentheses)

	Winter (DJF)	Spring (MAM)	Summer (JJA)	Fall (SON)
Seasonal Precipitation	12 (1.6)	6 (0.5)	0.8 (0.2)	4.5 (0.8)

Source: Abatzoglou et al. 2009.

Note: DJF = December, January, February; MAM = March, April, May; JJA = June, July, August; SON = September, October, November.

## Projected Climate Change in California

Scientists use global climate models to simulate current climatic conditions and to project the future climate. The models incorporate state-of-the-science understanding of earth processes (e.g., biogeochemistry of ecosystems on land and in the ocean) and are based on fundamental physical, atmospheric and oceanographic principles. Overall, scientists have greater confidence in the ability of climate models to simulate changes in temperature and less confidence about precipitation, especially regional precipitation patterns and other climatic

variables that are affected by local conditions such as topography (Global Change Research Program 2009), which is not accounted for in current models (Intergovernmental Panel on Climate Change 2007).

By mid-century, the average annual mean temperature in California is projected to rise from 1.1°C (2°F) to more than 2.8°C (5°F), with little to no change in total annual precipitation (Luers et al. 2006). There is significant variability in the precipitation projections by individual model and emissions scenario. Individual simulations suggest that there could be up to a 10 to 20% decrease in total annual precipitation (Luers et al. 2006).<sup>2</sup>

## Effects of Climate Change on Ecological Processes in the Study Area

Both land cover types and covered species within the study area are vulnerable to climate change based on their ecology and natural history. While temperature rise in itself will have direct consequences on species viability and natural community distribution and composition, the effects of global warming on the amount and timing of precipitation and the frequency of severe weather and related disturbance events are also likely to affect the study area and, as a result, the natural communities, covered species, and the Plan's proposed conservation strategy. These potential effects of climate change are discussed below.

### Precipitation

Several of the land cover types in the study area will be influenced by continuing shifts in the amount and timing of precipitation, with effects on soil moisture available for plants, runoff and ground water recharge, and sediment movements from the hillsides to the watershed drainage areas. Two climate models and predictions of climate change for Northern California are widely accepted by scientists (Suttle and Thomsen 2007; Dukes and Shaw 2007). Both models predict increases in the annual total amounts of precipitation and in each rainfall event, but differ in timing changes. In one model, the typical mid-winter rain-free period would decrease. Changes in precipitation patterns would affect land cover types differently. In grasslands, mature native bunchgrasses have deep roots and can access water during short dry periods (Holmes and Rice 1996), but seedlings with shallow roots may not be able to survive during these periods. Therefore, a reduction in the mid-winter rain-free period could favor seedling establishment of native grasses. Woody plant seedling establishment could be similarly favored (Dukes and Shaw 2007). This could improve the native grass component of the

<sup>2</sup> The California Climate Change Center report summarizes projections using the National Center for Atmospheric Research Parallel Climate Model (PCM1), Geophysical fluids Dynamic Laboratory (GFDL) CM2.1, and the United Kingdom Met Office Hadley Centre Climate Model, version 3 (HadCM3) under the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emission Scenarios (SRES) B1 (low emissions), A2 (moderately-high emissions), and A1Fi (high emissions).

grasslands, increase shrub encroachment into the grasslands, and increase oak regeneration. However, increases in annual precipitation may favor the encroachment of mixed evergreen forests on areas of chaparral and oak woodlands (Lenihan et al. 2003). Redwoods and close-coned pines would expand from remnant, fragmented groves into surrounding oak woodlands and chaparral land covers.

In the second model, the rainy season would be extended from spring to summer, thus potentially benefiting native grasses and summer annual forbs, including summer wildflowers and the pest plant, yellow starthistle (*Centaurea solstitialis*). Increased herbaceous and woody biomass growth in response to increased precipitation would pose the risk of higher fire hazards. More frequent drought years are also predicted which in combination with more intense rainfall events would pose higher risks of soil erosion and drops in ground water levels. Temperatures are also predicted to increase (Dukes and Shaw 2007). As temperatures increase, non-native grasses would become more dominant and invasive.

## Increased Risk of Fire, Flooding, and Drought

California could experience a 55% increase in wildfire risk by mid-century (Luers et al. 2006). Many factors influence the likelihood of fires, including precipitation, winds, temperature, and vegetation. For some locations, increasing precipitation and temperatures may stimulate increased vegetation growth through a portion of the year, creating more fuel to burn later; other locations may experience decreasing precipitation and increasing temperatures, creating dry vegetation that can burn easily (Luers et al. 2006). Simulations indicate that the probability of fires greater than 500 acres increases under wetter conditions and decreases under drier conditions (Westerling and Bryant 2008).

The distribution and composition of vegetation communities may change due to increased fire activity (Brown and Hebda 1998). In the study area this could result in an increase in grasslands over woody land cover types (Lenihan et al. 2003).

Increased drought and flooding could also occur. Drought would reduce water availability for covered species and could in and of itself change natural community composition and distribution. Flooding could result from extreme rainfall events. Increased flooding could compromise the ability to restore streams and riparian areas and would have an unknown effect on aquatic species and natural communities.



# Effects of Climate Change on Species, Natural Communities, and Ecosystems

Several ecological responses to climate change have occurred during the past century. Most studies use species response to changes in temperature as the indicator of the effects of climate change. These responses, in concert with historic and predicted climatic changes, serve as the basis for identifying species, natural community and ecosystem vulnerabilities and predicting how individual species, natural communities, and the ecosystem will be affected by climate change in the study area. Four broad mechanisms of biological response to climate change are discussed below.

## Phenology

Phenology is the timing of seasonal events such as migration, flowering, and egg laying. Changes in phenology are reflected in shifts in the timing of events, potentially leading to phenological mismatch—that is, events that previously occurred at the same time would occur at different times. An example of phenological mismatch is the hatching of butterfly larvae *after* the peak flowering of host plants. Many studies have confirmed that the timing of biological events has shifted with changes in climatic conditions during the past few decades (Walther et al. 2002; Root et al. 2003; Root et al. 2005; Forister and Shapiro 2003). In general, species have demonstrated a phenological shift of  $4.2 \pm 0.2$  days/decade earlier at the middle latitudes ( $32^{\circ}$ – $49.9^{\circ}$ ) and  $5.5 \pm 0.1$  days/decade earlier at the higher latitudes ( $50^{\circ}$ – $72^{\circ}$  N) (Root et al. 2003). Phenological shifts are expected to increase as global climate change intensifies.

## Range and Distribution

Range is the area over which a species occurs or can potentially occur; distribution refers to where a species is located within its range. Range shifts can occur when a species moves from one location to another or expands its area due to changes in the environment (e.g., climatic variables, availability of food sources). A species' distribution can change in location and the number of disjunct populations within its range. Documented changes over the past century include shifts in dominant vegetation and in the documented ranges of butterflies and birds (Parmesan 1999; Pimm 2001; Walther et al. 2002; Easterling et al. 2000). Changes in range and distribution are especially problematic given the present fragmented character of species habitats. Shifts in range or distribution can isolate populations from one another, making them more vulnerable to genetic drift or local extinction. The shifting range of a species can also make previously protected areas unsuitable. Finally, narrowly distributed species (e.g., Bay checkerspot butterfly, Mount Hamilton thistle) and natural communities that already have restricted ranges due to urban growth, altitudinal gradients, or dependence on narrow environmental gradients are particularly vulnerable

because they likely have nowhere to move if their habitat becomes less suitable (Shainsky and Radosevich 1986; Murphy and Weiss 1992; Parmesan 1999; Pimm 2001; Walther et al. 2002; Easterling et al. 2000; Hillman pers. comm.).

## Abundance

Abundance is the number or density of individuals found in a particular location. Shifts in abundance can occur when climatic variables alter microhabitats, juvenile survival, resource availability, competition, and species dominance (Martin 1998; Walther et al. 2002; Millar et al. 2006). Documented changes include shifts in species density due to changes in resource availability and climatic gradients, decrease in species abundances due to increases in diseases and pests, and decrease in native species abundance due to increased competition from invasive species (Dukes and Mooney 1999; Millar et al. 2006; Pounds et al. 2006).

## Morphology and Genetics

Morphology is the study of form and structure in organisms; genetics is the internal code that governs morphology and behavior. Over very long time horizons, evolution changes morphology (and genetic frequency) to enhance species survival. Because these adaptations typically occur more slowly than do the environmental changes anticipated to result from climate change, many species will have difficulty adapting to climate change, resulting not only in a loss of genetic variability but in extinction of some populations and entire species as well (Davis and Shaw 2001).

## Land Cover Types

Land cover types with isolated ranges are most susceptible to climate change. In the study area, these land cover types are ponderosa pine woodlands, knobcone pine woodlands, redwood forest, lower-elevation scrub, and serpentine grassland. With the exception of lower-elevation scrub, regeneration of these land cover types is disturbance driven. Most commonly, fire frequency and intensity determine each community's ability to regenerate. Rises in sea level could restrict the range of lower-elevation scrub by flooding out lower elevations. Changes in fire regime and rise in sea level, along with other climatic variables that may increase or decrease environmental stressors, will either lead to expansion or reduction of these land cover types with isolated ranges.

## Ponderosa Pine Woodlands

Ponderosa pine woodlands have a limited distribution in the study area, occupying approximately 419 acres, or 0.1% of the study area. The stands are relics of a wider historic distribution during a cooler climatic period. Increased fire frequency could benefit the ponderosa pine community because the species is fire adapted. However, temperature rise is likely to further restrict the range of ponderosa pines by favoring species that thrive under warmer conditions. Ponderosa pine woodlands provide modeled habitat for three covered animal species (California tiger salamander, California red-legged frog, and western pond turtle).

## Knobcone Pine Woodlands

Knobcone pine woodlands occur only on the Santa Cruz Mountain ridgetops, often on serpentine-derived soils, at the western edge of the plan area, where they occupy approximately 711 acres, or 0.2% of the study area. The climatic conditions of marine fog, along with the water-retaining properties of serpentinite, allow continued persistence of knobcone pines in these locations (Vogl 1973). As an obligate fire-climax species, knobcone pines depend on periodic fires for regeneration. Fire allows for the release of seeds from the serotinous<sup>3</sup> cones, as well as creation of the bare mineral soil required for seed germination. Knobcone pine woodlands are bordered by chaparral at lower elevations and redwood or Douglas-fir at higher elevations. An increase in fire frequency and favorable climatic conditions could benefit knobcone pine. Conversely, if fires are too frequent, there is a risk that knobcone pine seedlings would be killed before producing seeds, thus jeopardizing the viability of the natural community. Knobcone pine woodlands provide habitat for three covered animal species (California tiger salamander, California red-legged frog, and western pond turtle).

## Redwood Forest

Redwood forest occupies approximately 9,693 acres, or 2% of the study area, in the Santa Cruz Mountains along creeks and valleys and on lower north- and east-facing slopes in the foothills. Although found in moist microclimates like knobcone pine woodland, redwood forest depends on fog to fulfill its moisture needs (Dawson 1998) and on fire for regeneration. In addition to fire, disturbances such as tree fall gaps and flooding also favor regeneration. Expansion of redwood forests could occur with increased fire frequency, although it is unclear how fire would affect the mosaic of redwood forest, knobcone pine, chaparral, and ponderosa pine, all of which are fire-adapted communities. Redwood forest provides habitat for four covered animal species:

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<sup>3</sup> Serotinous cones require fire to open and release the seeds they contain.

California tiger salamander, California red-legged frog, foothill yellow-legged frog, and western pond turtle.

## Serpentine Grassland

The presence of serpentine soil limits the distribution of serpentine grassland, which includes serpentine bunchgrass grassland, serpentine outcrops, and serpentine seeps. Serpentine soils provide habitat for a number of native grassland species because the extreme soil conditions allow natives to outcompete invasive European grasses. While changes in climatic conditions may not affect the extent of serpentine grassland as a whole, changes in microclimate conditions could lead to changes in species composition and dominance. Serpentine bunchgrass grassland occupies approximately 10,308 acres, or 2% of the study area. Serpentine outcrops occupy approximately 260 acres, 0.1% of the study area and provide habitat for four covered plants (Metcalf canyon jewelflower, most beautiful jewelflower, smooth lessingia, and Santa Clara Valley dudleya). Serpentine seeps—small wetlands located within serpentine grasslands and coastal scrub—occupy approximately 34 acres, or 0.01% of the study area and provide habitat for seven covered animal species (Bay checkerspot butterfly, California tiger salamander, California red-legged frog, western burrowing owl, western pond turtle, tricolored blackbird, and San Joaquin kit fox) and three covered plant species (smooth lessingia, most beautiful jewelflower and Mt. Hamilton thistle), of which one—Mt. Hamilton thistle—is restricted solely to serpentine seeps.

## Lower-Elevation Northern Coastal Scrub/Diablan Coastal Scrub

In the study area, northern coastal scrub/Diablan coastal scrub (coastal scrub) is found throughout the Santa Cruz Mountain and the Diablo Range, usually below elevations of 300 feet on south-facing slopes (California Partners in Flight 2004). Increases in sea level would decrease the range and distribution of this natural community if climatic conditions and habitat connectivity did not allow for upslope expansion. Coastal scrub occupies an estimated 10,306 acres, or 2% of the study area. Covered plants that may be found in this community include fragrant fritillary, and coyote ceanothus. Coastal scrub provides habitat for California red-legged frog and western burrowing owl.

## Covered Species

Life history, behavioral characteristics, and habitat requirements predispose certain covered species to be more susceptible to climate change than others. Within the study area, the species most vulnerable to climate change are those with limited dispersal ability, slow reproductive rate, specific habitat or soil

requirements, and limited habitat connectivity, as well as those already at the extreme of their range. Moreover, those species for which the study area includes a high proportion of their range or those for which critical habitat has been designated within the study area are of particular concern. For this analysis, covered species have been grouped into four categories on the basis of these characteristics and the ecological responses discussed above: butterflies, amphibians, reptiles, and plants. The four groups comprise a total of 10 species: Bay checkerspot butterfly, California red-legged frog, California tiger salamander, foothill yellow-legged frog, western pond turtle, coyote ceanothus, Santa Clara Valley dudleya, Metcalf Canyon jewelflower, Mount Hamilton thistle, and smooth lessingia (**Table F-3**). This analysis discusses the life history, behavioral characteristics, and habitat requirements that predispose these species groups are to be particularly susceptible to climate change.

## Butterflies

Butterfly species are sensitive to climate change due to their larval host plant and nectar-source dependence (Murphy and Weiss 1992). If the timing of host-plant availability changes without equal shifts in life-cycle timing, the phenological mismatch could affect reproductive success. In addition, the narrow habitat requirements of butterflies and host plants may lead to shifts in range, distribution, and abundance as a result of climate change.

In the study area, climate change has the potential to affect Bay checkerspot butterfly, a covered species under the Plan (**Table F-3**). This species occurrence is restricted to narrow environmental gradients, with the majority of its habitat located in the study area. Additionally, 16,601 acres or 91% of designated critical habitat for the species is located within the study area (66 FR 21450–21489).

## Amphibians

Amphibians' permeable skin, biphasic life cycles, and unshelled eggs make them sensitive to small changes in temperature and moisture (Carey and Alexander 2003). In most cases, amphibians in temperate climates can tolerate wide variations in temperature, but their dependence on aquatic environments for reproductive success could be comprised by changes in seasonal and regional climatic patterns. Decreases in precipitation or shifts in timing of precipitation would have an effect on reproductive success and adult survivorship due to increased risk of desiccation, reduced food supply, and increased predation due to reduced habitat availability. Such changes could lead to a range shift and changes in distribution and abundance. Increased evaporation of aquatic habitat due to increased temperatures could have indirect effects, such as the concentration of toxic chemicals that could lead to increased mortality and decreased reproductive success (Davidson et al. 2001; Carey and Alexander 2003).

In the study area, climate change has the potential to affect three covered amphibian species: California red-legged frog, California tiger salamander, and foothill yellow-legged frog (**Table F-3**). California red-legged frog and California tiger salamander both have limited dispersal ability and are dependent on the proximity and connectivity of aquatic environments with their upland habitat for reproductive success. Of the designated critical habitat for California red-legged frog, 150,962 acres (9%) is within the study area. Critical habitat for the Central population of California tiger salamander encompasses 28,096 acres, or 14% of the study area. Because foothill yellow-legged frog is not federally listed, critical habitat has not been designated. Nevertheless, the species has limited dispersal ability and is restricted to aquatic environments. Reproductive success is dependent on a narrow range of in-stream environmental gradients (e.g., temperature and stream flow velocity).

## Reptiles

The potential effects of climate change on reptiles are less well studied than its effects on amphibians. Some reptiles exhibit temperature-dependent sex determination, whereby increased air temperatures skew the sex ratio to favor females over males (Janzen 1994). If such a phenomenon applies to covered reptile species in the study area, global warming could result in a preponderance of females in the study area.

In the study area, climate change has the potential to affect western pond turtle (**Table F-3**). Gender shifts would not be notable until later in the permit term as this species is long lived and does not reach sexual maturity until at least 10 years of age. No critical habitat has been designated for this species and its range extends well beyond the study area.

## Plants

Even more than wildlife, plants are vulnerable to climate change. Changing the habitat conditions that are necessary for persistence of a given sensitive plant species (e.g., increased temperature, increased or decreased moisture) could result in extinction if the species' minimal habitat requirements are not met, or if the habitat becomes more favorable for other species (Hillman pers. comm.). Day length, temperature, moisture conditions, and the presence of the appropriate pollinators all play a critical role in reproductive timing and success. The dependence of plants on seed dispersal for movement across habitats and climatic gradients prevents them from moving quickly in the face of changing climatic conditions and habitat suitability. In addition, the specific soil requirements and physiological tolerance limits of plants along with limited habitat connectivity make plants particularly susceptible to climate change. All of the covered species in the study area have some degree of affinity for serpentine soils and most are dependent on serpentine soils for their habitat requirements (**Table F-3**).

## Conservation Strategy

Conservation biology is the basis of the conservation strategy, and the proposed reserve design anticipates some effects of climate change using a multi-scale approach. As such, it is designed to reduce species vulnerability and provides opportunities for species and natural communities to adapt in responses to climate changes. Biological goals and objectives were developed at the *landscape level* to encompass ecological processes, environmental gradients, biological diversity, and regional wildlife linkages. Conservation actions were developed to implement these goals and objectives. Landscape-level objectives and actions are generally developed at the scale of miles or tens of miles. By working at the landscape level, flexibility for climate change–driven shifts in range and distribution of species and natural communities is allowed. This landscape level approach allows for replication of ecosystems and populations to achieve a balance representation of natural communities and species habitats, support multiple species within the Reserve System, and protect of key ecosystem features. Land acquisition will target properties that provide connectivity within the Reserve System and among existing protected areas within and outside the study area and rural private lands. This will allow for northward and upslope movement, maintain and restore habitat linkages, and reduce fragmentation. In addition, habitat types across environmental gradients (topographic diversity) are targeted to provide topographic diversity and reduce the chance of population extinction (Murphy and Weiss 1992). Protection of a range of environmental gradients allows natural communities and species to adapt to changes in temperature and precipitation. It provides an opportunity for movement to areas where environmental conditions remain favorable for their persistence if climate change causes their current location to become unfavorable. Protection of key ecosystem features (i.e., riparian, aquatic) throughout the study area ensures that vulnerable species such as amphibians will have available habitat across a variety of environmental gradients. In addition, removal of barriers (i.e., fences and medians) and creation of safe passage ways (i.e., culverts under roads) within the study area will increase the permeability of the landscape to allow for species movement through and within the study area. Both increased landscape connectivity and permeability allow for species migration to occur across the landscape. Consequently, some species and natural communities within the study area would be able to “move” in response to climate change, allowing for shifts in range and distribution.

Conservation actions were also developed to address natural communities primarily through the enhancement, restoration, and management of vegetation types (i.e., land cover types). This medium scale is called the *natural community level*. Enhancement, restoration and other land management actions would increase the resilience of natural communities in the face of climate change. For example, grazing can be managed to provide some control of increasing shrub encroachment and pest plants, but an integrated program including non-grazing methods will be needed. Specific actions that would increase resilience include controlling invasive species and diseases through integrated pest and vegetative management, and improving habitat quality to increase resource availability for native species.

Finally, the specific needs for protection and enhancement of individuals, populations, and groups of populations of covered species were addressed. *Species-level* conservation actions were developed to supplement and focus actions developed at the broader scales and to ensure that all the needs of each covered species are addressed. Species-level conservation measures have a habitat focus. Examples include protection of specific habitat elements to allow for plant population expansion and creation. These species-specific actions would ensure that populations of each covered species are maintained, and monitoring would identify any early negative trends caused by climate change.

While the conservation strategy can help to ensure the movement of some communities across the landscape and can address through management actions, some of the effects of climate change are beyond the control of management or land acquisition. The conservation strategy cannot address changes in phenology, nor in morphology and genetics. For example, the serpentine communities are adapted to persist on serpentine soils. It is outside the scope of the conservation strategy to genetically modify these plants so that they can outcompete nonnative grasses on other soil types. Additionally, some responses, in terms of connectivity, are needed at scales greater than the Plan can provide and would necessitate planning in multiple counties. While the Plan can combat small shifts in range, distribution, and abundance at the landscape, natural community, and species levels, larger shifts due to climate change would extend outside the study area.

## Adaptive Management and Monitoring

The Adaptive Management and Monitoring Program enables the conservation strategy to respond to the effects of climate change. Landscape-level monitoring is designed to detect large-scale changes, such as changes in ecosystem processes, shifts in natural community distribution, and the integrity of landscape linkages. Community-level monitoring, in turn, is designed to detect changes in the composition and function of natural communities, populations of key predator or prey populations, invasive species, and other important habitat factors for covered species. Finally, species-level monitoring measures the effects of management actions on covered species abundance and distribution, as well as, the status and trends of covered species in the Reserve System. Collectively, these monitoring actions will allow for early detection and response to the effects of climate change, such as early identification of stressors (i.e., fire, flood, drought, pollution), increased abundance and distribution of invasive species, and changes in range, distribution, and abundance of natural communities and covered species. Both the conservation and monitoring actions described above will help to buffer the effects of climate change in the study area.



## Covered Activities and Climate Change

The Plan will provide endangered species permits to development in the study area. Accordingly, the covered activities may contribute to climate change by allowing increased emissions that result from urban expansion and vegetation removal. The covered activities listed below are expected to have the greatest potential effect on GHG emissions.

- **Urban Development.** All projects related to urban growth within designated urban areas. This covered activity will facilitate population growth in the study area and will likely result in increased motorized vehicle use, which in turn contributes to climate change. Increased energy use driven by population growth is also predicted.
- **Rural Capital Projects.** Projects related to new road construction in rural areas. As with urban development, any project that facilitates increased motorized vehicle use qualifies as a potentially significant contributor to climate change.
- **Rural Development.** Projects related to development outside designated urban areas. This covered activity will facilitate population growth in the study area, and will likely result in increased motorized vehicle use. Increased energy use driven by population growth is also predicted.

This impact analysis does not quantify the impacts from covered activities due to climate change. Predictions of how much covered activities will contribute to climate change cannot be made and it will be up to those projects to develop and implement their own mitigation for their future effects.

## Conclusions

The Plan will not be implemented independent of global climate change. The conservation strategy and Monitoring and Adaptive Management Program are designed to ensure that lands are acquired and managed in a way that preserves flexibility and increases resilience and that adverse impacts on the natural communities and covered species will be detected early. As the requirements of natural communities and species shift over time, the flexible nature of the plan and the perpetuity of funding will allow for management to occur throughout implementation and beyond the permit term. Accordingly, the Plan will change with the climate, ensuring species persistence to a much greater extent than would be afforded by other alternative approaches such as project-by-project mitigation.

## Literature Cited

- Abatzoglou, J.T., K.T. Redmond, L.M. Edwards, 2009. Classification of Regional Climate Variability in the State of California. *Journal of Applied Meteorology and Climatology* 48, 1527–1541.
- Bernazzani, P., B.A. Bradley, and J.J. Opperman. 2012. Integrating Climate Change Into Habitat Conservation Plans Under The U.S. Endangered Species Act. *Environmental Management*. DOI 10.1007/s00267-012-9853-2.
- Brown, K.J. and R.J. Hebda. 1998. Long-term Fire Incidence in Coastal Forests of British Columbia. *Northwest Science*, Volume 72, Special Issue No. 2, Washington State University Press, 1998.
- California Partners in Flight. 2004. Version 2.0. *The Coastal Scrub and Chaparral Bird Conservation Plan: A Strategy for Protecting and Managing Coastal Scrub and Chaparral Habitats and Associated Birds in California*. (J. Lovio, lead author). Stinson Beach, CA: Point Reyes Bird Observatory (PRBO) Conservation Science. Available: <<http://www.prbo.org/calpif/plans.html>>.
- Carey, C and M.A. Alexander. 2003. Climate change and amphibian declines: is there a link? *Diversity and Distributions*, Vol.9, pp. 111–121.
- Council on Environmental Quality and U.S. Department of the Interior. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy. Public Review Draft, January 2012. Available: <<http://www.wildlifeadaptationstrategy.gov/>>.
- Davidson, C., H. Bradley Shaffer, Mark R. Jennings. 2001. Declines of the California Red-Legged Frog: Climate, UV-B, Habitat, and Pesticides Hypotheses. *Ecological Applications*, 11(2), pp. 464–479.
- Davis, M.B and R.G. Shaw. 2001. Range Shifts and Adaptive Responses to Quaternary Climate Change. *Science*, 292, 173–180.
- Dawson, T.E. 1998. Fog in the California redwood forest: ecosystem inputs and use by plants. *Oecologia*, 117: 476–485.
- Dukes, J.S. and H.A. Mooney. 1999. Does global change increase the success of biological invaders? *Tree* 14(4): 135–139.
- Dukes, J.S. and M.R. Shaw. 2007. Responses to changing atmosphere and climate. Pp. 218-229, in: M.R. Stromberg, J.D. Corbin, and C.M. D'Antonio (Eds.) *California grasslands: ecology and management*. Berkeley: University of California Press.
- Easterling, David R.; Gerald A. Meehl; Camille Parmesan; Stanley A. Changnon; Thomas R. Karl; Linda O. Mearns. 2000. *Climate Extremes: Observations,*

- Modeling, and Impacts. *Science*, New Series, Vol. 289, No. 5487. pp. 2068–2074.
- Forister, M.L. and A.M. Shapiro. 2003. Climatic trends and advancing spring flight of butterflies in lowland California. *Global Change Biology*, 9, 1130–1135.
- Gershunov, A., D. Cyan, and S. Iacobellis. 2009. The Great 2006 Heat Wave over California and Nevada: Signal of an Increasing Trend. *Journal of Climate*. pp. 6181–6203.
- Global Change Research Program. 2009. Global Change Impacts in the United States. Available: <<http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009>>.
- Holmes TH, Rice KJ. 1996. Patterns of growth and soil-water utilization in some exotic annuals and native perennial bunchgrasses of California. *Annals of Botany* 78:233–43.
- Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: The Physical Science Basis, Summary for Policymakers. Approved at the 10th Session of Working Group I of the IPCC, Paris, February 2007. IPCC Secretariat, Geneva, Switzerland.
- Janzen, Fredric J. 1994. Climate Change and Temperature-Dependent Sex Determination in Reptiles. *Proceedings of the National Academy of Sciences of the USA*, 91(16), pp. 7487–7490.
- Julius, S.H., J.M. West, G.M. Blate, J.S. Baron, B. Griffith, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scott. 2008. *Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources*. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [Julius, S.H., J.M. West (eds.), J.S. Baron, B. Griffith, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scott (Authors)]. U.S. Environmental Protection Agency, Washington, DC, USA, 873 pp.
- Lenihan, James M., Raymond Drapek, Dominique Bachelet, and Ronald P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. *Ecological Applications*, 13(6), pp. 1667–1681
- Luers, A., D. Cayan, G. Franco, M. Hanemann, and B. Croes. 2006. *Our Changing Climate: Assessing the Risks to California*. A Summary Report from the California Climate Change Center. CEC–500–2006–077.
- Martin, T. 1998. Are Microhabitat Preferences of Coexisting Species under Selection and Adaptive? *Ecology*, 79(2), 656–670.

- Millar, C.I., R. Neilson, D. Batchelet, R. Drapek, and J. Lenihan. 2006. Climate change at multiple scales. Chapter 3 in Salwasser, H. and M. Cloughesy (eds). *Forests, Carbon, and Climate Change*. Oregon Forest Resources Institute Publication.
- Moser, S., G. Franco, S. Pittiglio, W. Chou, and D. Cayan. 2009. *The Future is Now: An Update on Climate Change Science Impacts and Response Options for California*. A Special Report. California Energy Commission. CEC-500-2008-071.
- Murphy, D. D., and S. B. Weiss. 1992. Effects of climate change on biological diversity in Western North America: Species losses and mechanisms. Chapter 26 in *Global Warming and biological diversity*, ed. R. L. Peters and T. E. Lovejoy. Castleton, New York: Hamilton Printing.
- National Research Council. 2010. America's Climate Choices: Panel on Advancing the Science of Climate Change; National Research Council. Available: <[http://www.nap.edu/catalog.php?record\\_id=12782](http://www.nap.edu/catalog.php?record_id=12782)>.
- Nemani, R., M. White, D. Cayan, G. Jones, S. Running and J. Coughlan. 2010. Asymmetric Climatic Warming Improves California Vintages. Available: <[http://meteora.ucsd.edu/cap/grapes/grape\\_final.PDF](http://meteora.ucsd.edu/cap/grapes/grape_final.PDF)>
- Parmesan, C. et al. 1999. Poleward shifts in geographical ranges of butterfly species associated with regional warming. *Nature*. 399, 579–583.
- Pimm, S.L. 2001. Entrepreneurial insects. *Nature*. 411, 531–532.
- Pounds, J.A. and M.R. Bustamente et al. 2006. Widespread amphibian extinctions from epidemic disease driven by global warming. *Nature*. 439: 161-167.
- Root, T.L. and Jeffery T. Price, et al. 2003. Fingerprints of global warming on wild animals and plants. *Nature*. 421, 57–60.
- Root, T.L.; Dena P. MacMynowski; Michael D. Mastrandrea; Stephen H. Schneider. 2005. *Proceedings of the National Academy of Sciences of the United States of America*, 102(21). pp. 7465–7469.
- Shainsky, L.J., and S.R. Radosevich 1986. Growth and water relations of *Pinus ponderosa* in competitive regimes with *Arctostaphylos patula* seedlings. *Journal of Applied Ecology* 23:957–966.
- Suttle, K.B. and M.A. Thomsen. 2007. Climate change and grassland restoration in California. *Madrono* 54(3):225–233.
- U.S. Environmental Protection Agency. 2009. A Framework for Categorizing the Relative Vulnerability of Threatened and Endangered Species to Climate Change. Available: <<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=203743>>.

Vogl, R. J. 1973. Ecology of knobcone pine in the Santa Ana Mountains, California. *Ecological Monographs* 43:125–143.

Walther, G., Eric Post, et al. 2002. Ecological responses to recent climate change. *Nature*, 416, pp. 389–395.

Westerling, A.L., and B.P. Bryant. 2008. Climate Change and Wildfire in California. *Climatic Change* 87:S231–S249.

## Personal Communication

Hillman, Janell M. Botanist. Santa Clara Valley Water District. San Jose, CA.  
December 12, 2007—email to Terah Donovan, Conservation Planner, Jones & Stokes, Oakland, CA.

**Table F-3.** Potential Climate Change Effects on Selected Covered Species

	Potential Climate Change Effects during Permit Term				
Species	Phenological Mismatch	Range and Distribution Shift	Change in Abundance	Morphology and Genetics	Rationale
<b>Butterflies</b>					
Bay checkerspot butterfly	X	X	X		Dependence on larval host plant presence restricts current range to serpentine soils with a suitable microclimate. Change in timing or intensity of seasonal event could have an effect on plant abundance and availability during the critical species reproductive period, as well as macro- and microclimatic suitability, leading to phenological mismatch and decrease in species abundance. Changes in microclimate suitability could further restrict species range and distribution.
<b>Amphibians</b>					
California red-legged frog	X	X	X		Life history and physical characteristics of amphibians make them dependent on climatic variables for reproductive success and species perseverance. Change in precipitation timing and quantity could change habitat availability during the breeding season, leading to a phenological mismatch, shift in range and distribution, or change in abundance. Increases in precipitation and lengthening of the rainy season could favor an increase in range and distribution and abundance. Decreases in precipitation and/or decreases in length or delayed timing of the rainy season could lead to phenological mismatches, range and distribution shifts, and decrease in abundance.
California tiger salamander	X	X	X		
Mountain yellow-legged frog	X	X	X		
<b>Reptiles</b>					
Western pond turtle			X	X	Turtles have exhibited temperature dependent sex-ratios. Temperature increases in the study area could result in skewed sex ratios, favoring females over males. An extreme decrease in males could lead to decreased abundance due to reduced mating frequency.
<b>Plants</b>					
Coyote ceanothus	X	X	X		Serpentine plant distribution is restricted to highly specialized and localized habitat requirements that include species-specific microclimate conditions coincident with serpentine soil occurrence. Restriction to serpentine soils limits species range and distribution to this soil type. Climate change could change microclimate conditions so that species can no longer persist within their current range. Increase in favorable microclimate conditions could lead to an expansion of distribution and increase in abundance, both in terms of number of populations and number of plants within each population. Change in timing or intensity of seasonal events could have an effect on
Santa Clara Valley dudleya	X	X	X		
Metcalf Canyon jewelflower	X	X	X		
Mount Hamilton thistle	X	X	X		
Smooth lessingia	X	X	X		

**Table F-3. Continued**

Species	Potential Climate Change Effects during Permit Term				Rationale
	Phenological Mismatch	Range and Distribution Shift	Change in Abundance	Morphology and Genetics	
Tiburon Indian paintbrush	X	X	X		pollinator reproductive and plant flowering periods leading to phenological mismatches.
Fragrant fritillary	X	X	X		
Loma Prieta hoita	X	X	X		
Most beautiful jewelflower	X	X	X		

Appendix G

## **Cost Model**





Santa Clara Valley Habitat Plan  
Implementation Budget Data and Assumptions

Aug-2012

**Final Plan**

## **Santa Clara Valley Habitat Plan Implementation Budget**

### **G-0a Assumptions / Notes**

### **G-0b Acres acquired by location and size**

### **G-0c Acres restored - land cover**

### **G-0d Reserve area managed - land cover**

### **G-0e Reserve area monitored - species**

### **G-1 Program Administration**

- a. Reserve staff
- b. Office space
- c. Utility cost for office space
- d. Office furniture, equipment, and supplies
- e. General office equipment
- f. Technology equipment / services
- g. Passenger vehicles and fuel
- h. Vehicle mileage allowance
- i. Overnight travel
- j. Insurance
- k. Staff training
- l. Staff uniforms
- m. Legal assistance
- n. Financial analysis assistance
- o. JPA meeting stipends
- p. Law enforcement / Public safety
- q. Public education/outreach

### **G-2 Shared Staff and Overhead (allocated to management, restoration, and monitoring)**

- a. Reserve staff
- b. Office furniture, equipment, and supplies
- c. Passenger vehicles and fuel
- d. Vehicle mileage allowance
- e. Overnight travel

### **G-3 Land Acquisition**

- a. Land acquisition costs over 50 years
- b. Cost assumptions: fee title by location and parcel size
- c. Due diligence
- d. Pre-acquisition surveys
- e. Site improvements: demolition, road obliteration and stabilization/abandonment, fences, gates, signs

## **Santa Clara Valley Habitat Plan Implementation Budget**

### **G-4 Habitat Restoration / Creation**

- a. Land cover type restored / created
- b. Cost of restoration / creation construction (contractors and reserve staff)
  - Design
  - Plans and specifications
  - Bid assistance
  - Pre-construction surveys
  - Construction
  - Construction oversight & monitoring
  - Post-construction oversight and monitoring
  - Restoration repair
  - Contingency
- c. Environmental compliance for restoration projects (CWA 404/401, CDFG 1602)
- d. Reserve staff
- e. Office furniture, equipment, and supplies
- f. Passenger vehicles and fuel
- g. Vehicle mileage allowance
- h. Overnight travel
  - i. Long-term management on restored lands
  - j. Long-term biological monitoring on restored lands

### **G-5 Reserve Management and Maintenance**

- a. Reserve staff
- b. Office furniture, equipment, and supplies
- c. Overnight travel
- d. Passenger vehicles and fuel
- e. Vehicle mileage allowance
- f. Other vehicles, maintenance, and fuel
- g. Leased vehicles and equipment
- h. Special equipment and materials
  - i. Field facilities, including permanent seed bank
  - j. Maintenance and utilities for facilities
- k. Wells and water pumping
  - l. Invasive species control (reserve staff and contractors)
- m. Existing open space
- n. Contractors: management, maintenance, construction services for roads and bridges
- o. Environmental compliance for reserve management projects (NEPA/CEQA, NHPA)
- p. Remedial measures

## **Santa Clara Valley Habitat Plan Implementation Budget**

### **G-6 Monitoring, Research, and Scientific Review**

- a. Reserve staff
- b. Office furniture, equipment, and supplies
- c. Passenger vehicles and fuel
- d. Vehicle mileage allowance
- e. Overnight travel
- f. Biological monitoring by species and land cover (contractors)
- g. Natural communities biological monitoring (contractors)
- h. California Tiger Salamander breeding habitat (contractors)
- i. Enhanced monitoring on existing open space (contractors)
- j. Directed research
- k. Scientific review - Conservation Assessment Team and Science Advisors panel

### **G-7 Western Burrowing Owl Conservation Strategy**

- a. Grazing on managed land
- b. Equipment and tools cost, capital, operations, and annual maintenance
- c. Targeted studies - Baylands Region
- d. Monitoring of Western Burrowing Owl compensation sites (reserve system or other managed lands)
- e. Optional tasks, operational

### **G-8 Contingency Fund**

- General operating
- Land acquisition and site improvements

### **G-9 Post-permit Budget**

- a. Program administration
- b. Shared staff and overhead
- c. Reserve management and maintenance

## Legend

red numbers are assumptions or data entered directly into the worksheet

blue numbers are links from other worksheets in the workbook

black numbers are calculations based on the above numbers

Numbers provided by Santa Clara County Parks

Numbers provided by Santa Clara Valley Water District

Numbers provided by Santa Clara County Open Space Authority

Numbers provided by California Department of Parks & Recreation

Numbers provided by California Department of Fish & Game

Numbers provided by Valley Transportation Authority

Average of multiple sources

Numbers provided by ICF and HEG

Guesstimated numbers

Input tables/values pasted into budget model workbook

Indicates species or land cover for which management and monitoring costs are shifted upon restoration

Indicates input value or formula sensitive to time period, i.e., % of activity or number of acres per period/year

Indicates input value not yet available or placeholder value awaiting confirmation

Enter year for constant dollar values:

**2010 dollars**

Enter Plan Draft Status:

**Final Plan**

Enter Model Date:

**Aug-2012**

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

**G-1, G-2, and G-5 Staffing/Personnel Costs**

G-1a, G-2a, and G-5a: Salaries and Benefits, Travel

Salary per employee per year	Benefit multiplier (percent of salary)		G-2e: Days of overnight travel per FTE per year	G-2d: Mileage allowance per year per FTE (miles)	Number of FTEs, per year											
					0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
\$127,200	35%	Administrative Director	5	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
\$76,320	35%	IT - Database / GIS Management	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
\$74,200	35%	Budget Analyst	-	-	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
\$90,100	35%	Grant Specialist	-	500	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
\$63,600	35%	Public Education & Outreach	-	1,000	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
\$83,000	35%	Administrative Assistant	-	250	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
\$100,700	35%	Senior Scientist	3	-	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
\$90,100	35%	Project Manager/Conservation Planner	1	-	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
\$90,100	35%	Reserve Manager	-	-	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
\$68,900	35%	Field Staff	-	-	0.0	1.5	3.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
\$53,000	35%	Laborer	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total					1.5	7.0	8.5	9.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	
Total turnover staff: assumes full turnover every 2.5 years (2 turnovers per period)					1.5	14.0	17.0	19.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
New Staff Per Period including turnover					3.0	19.5	18.5	20.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	

50%	Admin-Secretary time allocated to program administration/public outreach
50%	Admin-Secretary time allocated to reserve management
\$186	Travel allowance per diem
3.00	Per diem multiplier for executive director to cover additional travel expenses such as airfare
\$0.514	Cost per mile for travel allowance

Assumes Administrative Director uses implementing entity-owned passenger car and field staff use owned trucks, see G-2c and G-5f

**Overhead cost allocation**

10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration
20%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research
100%	

**G-1, G-2, and G-5 Equipment and Vehicles**

**G-2b: Office Furniture and Equipment per employee**

Cost per FTE per replacement period	Cost of service contract per year	Equipment type	Replacement Period (years)
\$2,120		Common office furniture	20
\$2,120		Cubicle furniture	20
\$530		Office supplies (annual)	1
\$2,650	\$265	Computers	3
\$636	\$127	Cell phones	2
\$954	\$191	Mobile radios	3
2		unit of common office furniture purchased every 20 years	
1		Mobile radio per vehicle	

**G-1e: General Office Equipment**

Cost per year (leased items) / cost per item (purchased items)	Cost of service contract per item per year	Type of Equipment	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
\$11,660	\$0	Color printer/copy machine/scanner (lease)	-	1	1	1	1	1	1	1	1	1	1
\$6,360	\$0	Office telephone systems (lease)	-	1	1	1	1	1	1	1	1	1	1
\$1,590		Books and journals (purchase)	-	5	5	5	5	5	5	5	5	5	5
\$265		New fax machines purchased	-	1	1	1	1	1	1	1	1	1	1
		Old fax machines retired	-	-	1	1	1	1	1	1	1	1	1
	\$0	Total fax machines	-	1	1	1	1	1	1	1	1	1	1
\$1,484		New printers purchased	-	2	2	2	2	2	2	2	2	2	2
		Old printers retired	-	1	1	2	2	2	2	2	2	2	2
	\$0	Total printers	-	1	2	2	2	2	2	2	2	2	2
\$514		New digital cameras purchased	-	4	4	4	4	4	4	4	4	4	4
		Old digital cameras retired	-	2	4	4	4	4	4	4	4	4	4
	\$0	Total digital cameras	-	2	2	2	2	2	2	2	2	2	2
\$2,650		Radio base station purchased	-	1	-	1	-	1	-	1	-	1	-
		Radio base station retired	-	-	-	1	-	1	-	1	-	1	-
	\$106	Total radio base stations	-	1	1	1	1	1	1	1	1	1	1
\$6,360		Trunked radio system (shared tower and repeaters)	-	1	1	1	1	1	1	1	1	1	1

Assumes printer and phone maintenance/service contracts provided at no cost by Permittees.

5	year replacement period for fax machine and printer.
3	year replacement period for digital cameras.
10	year replacement period for radio base station.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

G-1f: Technology Equipment/Services			Number of items leased, purchased, or retired, by period											
Cost per item	Cost of software update or service contract per 5-year period	Type of Equipment	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
\$10,600		New GIS/database servers purchased	-	-	-	-	-	-	-	-	-	-	-	
	\$1,060	Old GIS/database servers retired	-	-	-	-	-	-	-	-	-	-	-	
		Total GIS/database servers	-	-	-	-	-	-	-	-	-	-	-	
\$5,300		New tablet PC purchased	-	2	2	2	2	2	2	2	2	2	2	
		Old tablet PCs retired	-	-	2	2	2	2	2	2	2	2	2	
	\$530	Total tablet PCs	-	2	2	2	2	2	2	2	2	2	2	
\$11,130		New plotters purchased	-	1	-	1	-	1	-	1	-	1	-	
		Old plotters retired	-	-	-	1	-	1	-	1	-	1	-	
	\$424	Total plotters	-	1	1	1	1	1	1	1	1	1	1	
\$4,240		New GPS units purchased	-	2	2	2	2	2	2	2	2	2	2	
		Old GPS units retired	-	-	2	2	2	2	2	2	2	2	2	
	\$742	Total GPS units	-	2	2	2	2	2	2	2	2	2	2	
\$7,420		New GIS software purchased	-	-	-	-	-	-	-	-	-	-	-	
		Old GIS software retired	-	-	-	-	-	-	-	-	-	-	-	
	\$1,590	Total GIS software	-	-	-	-	-	-	-	-	-	-	-	
\$3,180		New computer software purchased	-	2	2	2	2	2	2	2	2	2	2	
		Old computer software retired	-	-	2	2	2	2	2	2	2	2	2	
	\$742	Total computer software	-	2	2	2	2	2	2	2	2	2	2	
\$31,800		annual cost of contract GIS services, years 1 - 25												
\$21,200		annual cost of contract GIS services, years 26 - 50												
5		year replacement period for GIS and database equipment purchased.												
3		year software upgrade cycle												

**Assumptions/Notes:**

GIS services contracted with local partners or other entities.

**G-2c and G-5f: Passenger Vehicles and Fuel**

G-2c and G-5f: Passenger Vehicles and Fuel				Number of vehicle purchased, or retired											
Purchase price per vehicle	Fuel cost per vehicle per year		Maintenance cost per vehicle per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
\$21,624		New passenger cars purchased, per period	\$1,248	-	1	-	2	-	2	-	2	-	2	-	
		Old passenger cars retired, per period		-	-	-	2	-	2	-	2	-	2	-	
	\$1,590	Total passenger cars, per year, per period		-	1	1	1	1	1	1	1	1	1	1	
\$31,800		New 4WD trucks purchased, per period	\$2,080	-	2	2	3	3	3	3	3	3	3	3	
		Old 4WD trucks retired, per period		-	-	2	3	3	3	3	3	3	3	3	
	\$2,120	Total 4WD trucks, per year, per period		-	2	2	2	2	2	2	2	2	2	2	
\$8,480		New ATVs and trailers purchased, per period	\$520	-	1	1	2	1	2	1	2	-	1	1	
		Old ATVs and trailers retired, per period		-	-	1	1	2	1	2	1	2	-	1	
	\$424	Total ATVs and trailers, per year, per period		-	1	1	2	2	2	2	2	1	1	1	
		Total vehicles		-	4	4	5	5	5	5	5	4	4	4	

**G-5g: Leased Vehicle/Equipment**

Daily Lease Cost	Average days of use per 1,000 acres per year	Type of Vehicle / Equipment
\$244	2	Tractor
\$138	2	Small tractor
\$207	2	Dump truck
\$104	2	Fire truck

**G-1 Other Program Administration**

**G-1b: Office Space**

Assumes Implementing Entity will lease office space.

2,000	Total space leased per period (square feet)
\$2.12	Cost per square foot per month, including utilities

**G-1c: Utility Costs**

Utility costs included in office lease costs, above.

\$0.00	Annual cost per sq. ft. of office space
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**G-1j: Insurance**

\$1,858	Automobile insurance cost per year per vehicle
\$5,830	Directors' and officers' insurance cost per year
\$5,830	General liability insurance cost per year
\$8,745	Professional liability insurance cost per year

**G-1k: Staff Training**

\$318	Annual cost of training per staff member (excluding travel)
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**G-1l: Uniforms**

\$0	Annual cost for t-shirts and polos for all employees
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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

**G-1m: Legal Assistance**

Assumes outside legal counsel or cost of in-house counsel shared from a partner agency, particularly after start-up period.

		Hours of legal assistance per period - start-up
1,000		Hours of legal assistance per subsequent 5-year period
\$371		Hourly rate for legal assistance

**G-1n: Financial Analysis Assistance**

Assumes periodic financial assessments performed by outside contractors.

3		Year interval between financial analyses
\$37,100		Cost of Financial Analysis per three-year period

**G-1o: JPA Member Meeting Stipend**

8		Number of JPA members
\$318		Stipend per meeting per member
-		Number of meetings per year at start-up
20		Number of meetings per period years 1-5
20		Number of meetings per period years 6-10 and 11-15
10		Number of meetings per five-year period years thereafter

**G-1p: Law Enforcement / Public Safety**

Law enforcement and public safety costs on existing open space will be covered by County Parks through County Parks Rangers and the County Sheriff.

\$8.48		Law enforcement cost per reserve acre per year
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**G-1q: Public Education / Outreach**

Covers costs for material used during implementation such as brochures, fliers, meeting handouts, and posters. Includes costs for design and layout and printing.

\$0		Annual cost at start-up
\$53,000		Annual cost after start-up

**G-3 Land Acquisition**

**G-3a: Land Cover Type Acquired by Time Period**

Easements assumed for agricultural land and ranchland per the assumptions below.

300		Number of acres acquired in Remote West Hills during plan development ( <b>one</b> transaction, fee title).
200		Number of acres acquired in Near East Hills during plan development ( <b>one</b> transaction).
11%		Percent of each land cover type acquired in each 5-year period beginning in year 1, assuming acquisition complete by year 45, and acres acquired during plan development deducted from first period.
0%		Percent of Valley Floor that is agricultural land in the Pajaro River Valley that will be acquired using conservation easements
50%		Percent of Remote and Near Hills that is ranchland that will be acquired using conservation easements.
80%		Percent of fee title cost required for easement acquisition
3%		Contingency factor for land acquisition and site improvements

**G-3b: Proposed Land Acquisition Cost Assumptions, by location and parcel size (fee title purchase price per acre in 2010 dollars)**

Location	Less than 50 acres	50 - 250 acres	Over 250 acres
Near East Hills	\$28,000	\$9,000	\$8,000
Near West Hills	\$28,000	\$9,000	\$8,000
Remote East Hills	\$10,000	\$9,000	\$6,000
Remote West Hills	\$10,000	\$9,000	\$6,000
Almaden Valley / Valley Floor	\$34,000	\$17,000	\$16,000

For cost estimating purposes, land costs assumed to remain constant (in real terms) over time. See Chapter 9 for automatic and periodic inflation factors that are built into the fees to account for expected increases in land cost over time.

**G-3c: Due Diligence**

170		Number of acquisitions over plan term, including acquisitions during plan development (below)
2		Number of acquisitions during plan development.
1.25		Due diligence premium for land not acquired but surveyed/processed for potential acquisition. Applies to number of acquisitions and amount of land surveyed.
\$5,300		Appraisal cost per acquisition
\$530		Preliminary title report cost per acquisition
\$3,445		Phase 1 site assessment cost per acquisition
\$4,348		Legal description cost per acquisition
12,500		Average acquisition parcel boundary length in feet
\$0.48		Cost per linear foot for boundary survey
\$0.37		Cost per linear foot for monumentation

**G-3d: Pre-acquisition surveys - contractor hours**

12		Average hours per 100 acres for land cover type surveys including report writing
16		Average hours per 100 acres for covered species habitat surveys including report writing
32		Average hours per 100 acres for covered plant surveys including report writing
28		Average hours per 100 acres for covered wildlife surveys including report writing
100		Acres average/minimum parcel size for pre-acquisition surveys

Notes:

Land cover type surveys include surveys for federal and state jurisdictional waters, and submitting of a report to the USACE and obtaining a verification (includes some hours to respond to any changes the Corps may require). Land cover type and wetland delineation surveys will occur concurrently. Covered plant surveys include three visits during the blooming season to cover different blooming times.

Hours include field work and report writing.

**G-3e: Site Improvements**

Site improvements for land acquired during plan development assumed to occur during years 1 -5 of plan implementation.

Road and fencing improvements will facilitate grazing operations for ongoing landscape management.

\$5,300		Demolition of old facilities per 500 acres
\$4,240		Repair and replacement of gates per 100 acres
\$2,650		Signs (boundary, landbank, etc.) per 100 acres
\$2,120		Other security (e.g., boarding up barns) per 100 acres
\$11.66		Average cost of new fence installation by linear foot, once land is acquired
\$4.24		Average cost per linear foot for boundary fence repair or removal upon acquisition
27,800		Average linear feet of new fencing installed upon acquisition per 5-year time period; function of acquisitions over time
12,500		Average linear feet of existing fencing per acquisition
35%		Proportion of existing boundary fence that needs repair or removal at acquisition
\$106,000		Average cost per mile for road obliteration upon acquisition (re-contouring to natural contours, compaction, erosion control, seeding with natives and weed control)
0.25		Average miles of road obliterated upon acquisition per 1,000 acres acquired
\$21,200		Average cost per mile for road stabilization and abandonment upon acquisition (erosion control measures, removal of stream crossing reasures, ripping roadbed, etc.)
0.5		Average miles of road stabilization and abandonment upon acquisition per 1,000 acres acquired

Note: an additional 0.5 miles of road per 1,000 acres of Reserve System are assumed to be removed by simply closing off access and not doing any obliteration or erosion control work. No costs are assumed for this action.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

## G-4 Habitat Restoration / Creation

### G-4a: Land Cover Type Restored / Created by Time Period

12.50%	Percent of each land cover type restored in each 5-year period beginning in year 1 through year 40, assuming all restoration completed by year 40
5	Width of stream (in feet) used to calculate total acres restored

### G-4b: Estimated cost per acre or linear foot of restoration by land cover type

#### Notes:

All restoration projects implemented by year 40.

Reserve staff would prepare restoration management plans.

Restoration planning, design, and implementation will be accomplished through a combination of contractors with staff oversight and management.

Plan, specification, and engineering work, bid assistance, and construction oversight are accounted for in the 5-year period in which construction takes place.

Five years of post-construction maintenance will be conducted in the 5-year period after construction takes place.

Post-construction restoration monitoring and maintenance is a 5-year period of staff monitoring and contractor remediation to ensure successful implementation of plan drawings,

including plant replacement, irrigation maintenance, weed control, erosion control, and repair of any substandard work.

	Willow and mixed riparian forest, scrub, and woodland	Central California sycamore alluvial woodland	Coastal and Valley Freshwater marsh	Seasonal wetlands	Ponds	Stream
Unit	Acre	Acre	Acre	Acre	Acre	Linear Ft.
Cost Category						
Design	\$1,060	\$1,060	\$1,060	\$1,060	\$1,060	\$5
Plans, specifications, and engineering	\$10,600	\$9,275	\$12,720	\$14,310	\$13,250	\$69
Bid assistance	\$212	\$212	\$318	\$318	\$318	\$1
Pre-construction surveys	\$390	\$390	\$104	\$104	\$104	n/a
Construction	\$42,400	\$37,100	\$63,600	\$71,550	\$53,000	\$276
Construction oversight & monitoring	\$2,120	\$1,855	\$3,180	\$3,578	\$2,650	\$14
Post-construction monitoring & maintenance	\$12,720	\$11,130	\$9,540	\$10,733	\$7,950	\$41
Restoration repair	\$6,360	\$5,565	\$9,540	\$10,733	\$7,950	\$41
<b>Total per acre cost</b>	<b>\$75,862</b>	<b>\$66,587</b>	<b>\$100,062</b>	<b>\$112,385</b>	<b>\$86,282</b>	
<b>Total per linear ft cost</b>						<b>\$447</b>
<b>Restoration contingency</b>	<b>\$11,379</b>	<b>\$9,988</b>	<b>\$15,009</b>	<b>\$16,858</b>	<b>\$12,942</b>	<b>\$67</b>

#### Other Assumptions:

25%	Plans, specifications, and engineering as percent of construction cost for non-aquatic restoration
20%	Plans, specifications, and engineering as percent of construction cost for marsh and seasonal wetland restoration
5%	Construction oversight and monitoring as percent of construction cost
30%	Post-construction monitoring and maintenance as percent of construction cost for woodland and riparian
19%	Post-construction monitoring as percent of construction cost for aquatic and wetland
19%	Percent of construction costs needed for restoration repair
19%	Contingency factor for restoration/creation; assumed to be higher than standard contingency
\$0	Ogier Ponds restoration project cost expected in years 6 - 10
0%	Percent of Ogier Ponds restoration project cost allocated to SCV HCP/NCCP
0.0	Miles of stream restored in Ogier Ponds project, expected in years 6-10

### G-4c: Environmental Compliance for Restoration Projects

Number of Projects Requiring Compliance Actions	Project size	Cost per project size and compliance category		
		CWA 404/401	CDFG 1602	Other
70	Small/simple	\$5,300	\$2,650	\$10,600
35	Medium/more complex	\$10,600	\$4,240	\$10,600
7	Large/most complex	\$26,500	\$8,480	\$10,600
12.50%	Percentage of projects requiring compliance in each 5-year period between years 1 and 40; linked to restoration over time			

## G-5 Management and Maintenance

### G-5h: Reserve Management Equipment, Materials, and Data

\$3,180	Capital cost of other equipment (e.g., hand-held tools and machines) and non-liquid materials (e.g., road gravel) per 1,000 reserve acres per year
\$530	Operational cost of equipment per 1,000 reserve acres per year
\$3,710	Cost per period to acquire aerial photos every 5 years to re-map land cover. Labor provided by Implementing Entity staff.

#### Notes:

Capital costs include the capital component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.

Operational costs include the operational component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.

Operational costs also include portable radios, small pumps, piping, generator, saw, and demolition hammers.

Grazing is assumed to be an important tool in landscape management on ranchland under conservation easements or grazing leases.

### G-5i: Field Facilities

10,000	Threshold for acres of reserve served by each workshop/parking area
\$530,000	Cost to build a workshop/parking area
\$0	Cost to build native plant nursery (\$75,000)
\$795	Cost of pre-construction surveys per project
5%	Construction oversight and monitoring as percent of construction cost
\$63,600	One-time cost to establish permanent seed bank collection

Note: Field facilities contain an area for equipment storage, a manager's office, a shared office, a locker room, restrooms, and a parking area.

Native plant nursery facilities assumed shared with other land management entities.

The seed bank collection will be established at the Rancho Santa Ana Botanic Gardens (or similar institution). Costs account for seed bank collection design, collection time by consultants or Implementing Entity staff,

seed banking fees at the storage institution, and miscellaneous expenses.

Six covered plant species would be established at the permanent seed bank: Santa Clara Valley dudleya, coyote ceanothus, most beautiful jewel-flower, Metcalf Canyon jewel-flower, smooth lessingia, and Mt. Hamilton thistle.

Seed bank established during years 1 - 5.

### G-5j: Facilities Maintenance and Utilities

\$10,600	Maintenance cost per facility per year
\$2,650	Utilities cost per field facility per year
\$0	Annual operating cost for native plant nursery

### G-5k: Wells and Water Pumping

0.5	Number of wells per 1,000 acres
\$31,800	Cost to drill a well
\$15,900	Cost of pump and related equipment
\$265	Annual cost to operate pump per well/pump.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

G-5f: Invasive Species Control

Management activities for invasive species by land cover

Land Cover Type	Application of herbicides	Prescribed burns	Average proportion of land cover burned per year (%)	Acres managed with prescribed burns (total in year 50)	Feral pig management	Brown-headed Cowbird	Grazing
California Annual Grassland	x	x	5.0%	665.0	x		x
Serpentine Bunchgrass Grassland		x	10.0%	400.0	x		x
Serpentine Rock Outcrop / Barren							
Serpentine Seep					x		
Rock Outcrop					x		
Northern Mixed Chaparral / Chamise Chaparral							
Mixed Serpentine Chaparral							
Northern Coastal Scrub / Diablan Sage Scrub		x	2.5%	35.0	x		x
Valley Oak Woodland	x	x	5.0%	85.0	x		x
Mixed Oak Woodland and Forest					x		x
Blue Oak Woodland	x	x	5.0%	55.0	x		x
Coast Live Oak Forest and Woodland					x		x
Foothill Pine - Oak Woodland		x	2.0%	1.6	x		x
Mixed Evergreen Forest					x		
Willow Riparian Forest and Scrub						x	x
Central California Sycamore Alluvial Woodland					x		x
Mixed Riparian Forest and Woodland					x	x	x
Redwood Forest						x	x
Ponderosa Pine Woodland		x	1.0%	0.0	x		x
Knobcone Pine Woodland		x	3.0%	0.0	x		x
Coastal and Valley Freshwater Marsh							x
Seasonal Wetland					x		
Pond							x
Streams (miles)							
<b>Total</b>				<b>1,241.6</b>			

\$530 Cost of weed management supplies (not labor) per 1,000 acres of reserve per year, for hand spraying. Applies to all reserve acres

\$27 Cost of applications of herbicides per period per acre managed

\$48 Cost of prescribed burns per acre burned

\$1,325 Cost of feral pig management per year per 1,000 acres managed

\$32 Cost to control brown-headed cowbird per year per acre managed. Would occur periodically in strategic locations throughout the reserve system.

Note: Bullfrog management activities will be conducted by reserve staff. All herbicides applied according to label instructions. Pesticides may be applied using aerial, truck, or hand application.

Grazing will be used as applicable for weed management in lieu of herbicides and prescribed burns. Some rangeland may be leased for grazing and some ranchland acquired with conservation easements will be grazed.

Management activities for control of non-native fish

177 Acres of ponds acquired and restored in reserve system, at end of plan term.

0.5 Acres per pond (Table 5-12)

30% Percent of ponds managed for control of non-native fish

0.5 Number of management activities (applications) per pond per year to control non-native fish assuming management occurs every other year.

\$106 Cost to control non-native fish per pond per application (supplies only, not labor).

Note: Management activities for non-native fish will be done by reserve staff. Costs for management for non-native fish in ponds in existing open space covered in Table G-5m.

Invasive species control on restored wetlands covered as a restoration cost.

G-5m: Management activities on existing open space

Acres of existing County Parks that will be managed for the Habitat Plan	Almaden Quicksilver County Park	Anderson Lake County Park	Calero County Park	Coyote Lake-Harvey Bear Ranch County Park	Joseph D. Grant County Park	Mt. Madonna County Park	Santa Teresa County Park	Uvas Canyon County Park	Total
Total Managed Acres (Table 5-5)	653	486	1,690	825	7,760		877		12,291
Average annual species and natural community management cost per acre	\$95	\$80	\$64	\$95	\$53	\$42	\$95	\$42	
Annual management cost for existing open space unit	\$62,296	\$38,637	\$107,484	\$78,705	\$411,280	\$0	\$83,666	\$0	\$782,068

Management activities begin in year 6.

Does not include other costs such as recreation and law enforcement / public safety because those services are already provided by County Parks and the County Sheriff.

Acres of existing Open Space Authority lands that will be managed for the Habitat Plan (Table 5-5)	1,000
Average annual species and natural community management cost per acre	\$95
Annual management cost for existing open space	\$95,400

Management activities begin in year 6.

G-5n: Contractors - for on-going management and maintenance

\$106,000	Reserve unit management plans: One for each of five reserve units. Cost per initial plan. First 3 written in first five years and another 2 written in second five years.
\$21,200	Cost to update reserve unit management plan once every 5 years.
\$1,590	Cost for pond maintenance (dredging) per acre of pond every 5 years
\$1,060	Cost of dirt (ranch) road maintenance per mile of road per year
0.75	Miles of dirt (ranch) road constructed, per 1,000 acres acquired
\$2,650	Cost for other maintenance services per 1,000 acres of reserve per year

Costs for Neighboring Landowner Agreement baseline and land cover surveys would be incurred by the landowner.

Other maintenance services include mowing, grading, pest control, diskling for fire breaks, fencing, alarms, janitorial services, removing debris associated with illegal marijuana cultivation.

Pond maintenance services on restored ponds covered as a restoration cost.

G-5n: Contractors - capital costs for construction services including bridge and roadway design, paving, fencing, grading, and boundary surveying services

\$84,800	Cost for paved road construction per mile
\$42,400	Cost for dirt (ranch) road construction per mile
-	Miles of paved road constructed, per 1,000 acres acquired
0.75	Miles of dirt (ranch) road constructed, per 1,000 acres acquired
0.5	Number of vehicle bridges installed per period
\$636,000	Cost per vehicle bridge to install
	Number of trail bridges installed per period
\$22,260	Cost per trail bridge to install
\$795	Cost of pre-construction surveys (per year for road construction and per project for bridge installation)
5%	Construction oversight and monitoring as percent of construction cost
\$0	Seed money to implement recommendations of feasibility study regarding wildlife linkages (originally \$1,500,000)

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

G-5o: Environmental Compliance for Reserve Management Projects

Number of Projects Requiring Compliance Actions	Project size	Cost per project size and compliance category	
		NEPA/CEQA	NHPA
70	Small/simple	\$5,300	\$2,650
35	Medium/more complex	\$42,400	\$3,710
7	Large/most complex	\$106,000	\$9,010
12.50%	Percentage of projects requiring compliance in each 5-year period between years 1 and 40; linked to restoration over time		

G-5p: Remedial Measures

10%	Percent of reserve management and maintenance operational cost assumed to be needed for remedial actions on reserve lands.
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Notes:

Applies to operational budget for management activities on reserve lands.

Applies to western burrowing owl conservation strategy management costs from Table G-7.

Management costs include overall reserve management.

Covers costs associated with responses to adaptive management findings as well as costs for restoration or maintenance of reserve areas in response to other changed circumstances such as wildfire or drought.

Remedial measures for restoration activities are included as a restoration cost.

## G-6 Monitoring, Research, and Scientific Review

Notes:

Compliance monitoring for implementation will be conducted by program administration staff and is addressed under the program administration cost category.

General landscape level surveying and monitoring will be done by staff, once every 5 years.

Pre-acquisition survey costs are covered under the land acquisition cost category.

Monitoring on restored/created wetlands is addressed under the restoration cost category.

Pre-construction surveys are assumed to occur prior to construction of covered activities on the reserve system, and costs are estimated as a component of those restoration and management costs.

Construction monitoring is assumed to occur periodically during construction of covered activities and conservation measures, and costs are estimated as a component of those restoration and management costs.

Implementing entity monitoring staff will plan, coordinate, and report on the monitoring categories described below.

Contractors will conduct the field monitoring and data analysis.

Pre-acquisition, pre-construction surveys, and construction monitoring for covered activities outside of the reserve system will be paid for by developers.

\$265,000 Cost to develop a monitoring plan during the first 5 yrs of implementation (e.g., to develop monitoring protocol, success criteria, etc.)

\$53,000 Cost to update monitoring plan every 10 years. These costs would be supplemented by the ongoing work of the science advisors.

G-6f: Biological monitoring contractor hours per year by species and land cover for complete reserve system (covers Validation and Status & Trends Monitoring)

Species	Unit	Habitat Type that is monitored annually	Habitat added to Reserve System that is Monitored (Table 5-17) or Occurrence (Table 5-16)	Number of monitoring days per year (complete reserve system) Do not change, originally derived from Alt 2 (8/2007). Adjust calculated factor instead.	Number of contractors per visit (complete reserve system) Do not change, originally derived from Alt 2 (8/2007).	Total person hours per year (8 hour days) - Function of acres monitored and calculated ratio from Alt 2 (8/2007) intensive monitoring here.	Acres or miles per hour per year (calculated from Alt 2, 8/2007) Used as constant so that total person-hrs are a function of acres monitored. Adjust for less intensive monitoring here.	Cost Factor for Cost Worksheet: Annual cost for monitoring, complete reserve system
California Red-Legged Frog	acres	Primary (Breeding)	1,300	40	2	569	2.29	\$72,281
California Red-Legged Frog - streams	miles	Primary (Breeding)	n/a	5	2	-	n/a	\$0
California Tiger Salamander	acres	Breeding	150	30	2	493	0.30	\$62,680
Pond Turtle	acres	Primary (Breeding)	7,000	10	2	115	61.08	\$14,567
Pond Turtle (streams)	miles	Primary (Breeding)	n/a	5	2	-	n/a	\$0
Foothill Yellow-Legged Frog (streams)	miles	Primary (Breeding)	30	25	2	119	0.25	\$15,101
San Joaquin Kit Fox	acres	Secondary habitat (dispersal)	4,000	30	2	548	7.30	\$69,644
Western Burrowing Owl - overwintering	acres	Overwintering	-	20	1	-	99.82	\$0
Western Burrowing Owl - breeding	acres	Breeding	-	20	1	-	5.00	\$0
Townsend's Bat	acres	Roosting	n/a	15	1	-	n/a	\$0
Least Bell's Vireo	acres	Primary (Breeding)	600	25	1	177	3.40	\$22,463
Tricolor Blackbird	acres	Primary (Breeding)	1,000	15	1	104	9.58	\$13,274
Golden Eagle	acres	Primary (Breeding)	n/a	15	1	-	n/a	\$0
Bay checkerspot butterfly	acres	Primary (Breeding)	3,800	40	4	1,248	3.04	\$158,639
Total				295		3,373		
Total annual cost (rounded)						\$430,000		\$430,000

Notes

Monitoring focus is on ponds and wetlands

Monitoring focus is on ponds

Pond turtle surveys conducted mostly at same time as CRLF surveys

Pond turtle surveys in streams overlap with Foothill yellow-legged frog surveys

See G-7 Western Burrowing Owl

See G-7 Western Burrowing Owl

Surveys of buildings and other structures

Intensive surveys in breeding season

Intensive surveys in breeding season

Spot surveys of possible nest sites throughout the year

Intensive surveys in spring and early summer

G-6g: Natural communities biological monitoring contractor hours per year by land cover for complete reserve system (covers Validation and Status & Trends Monitoring)

Natural Communities	Unit	Natural Community added to Reserve System that is Monitored (Table 5-13)	Number of monitoring days per year (complete reserve system)	Total person hours per year (8 hour days) for 45,000 acre complete reserve system	Total person hours per year (8 hour days) - Function of acres monitored and calculated ratio for 45,000 acre reserve	Acres per hour per year (calculated for 45,000 acre reserve) Used as constant so that total annual person-hrs is a function of acres monitored	Cost Factor for Cost Worksheet: Annual cost for monitoring, complete reserve system
Grassland	acres		17,440	30	226	77.29	\$28,679
Chaparral & Northern Coastal Scrub	acres		2,500	2	16	223.13	\$1,424
Oak Woodland	acres		12,900	6	48	383.33	\$4,277
Riparian Forest and Scrub	acres		971	20	160	7.75	\$15,924
Conifer Woodland	acres		10	12	86	3	\$370
Wetland	acres		155	24	192	0.36	\$54,036
Open Water (aquatic)	acres		177	2	16	7.50	\$3,000
Total			34,153		768	598	\$107,710

Notes

includes monitoring for California Ground Squirrel

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0a: Master list of assumptions used to develop Habitat Plan Implementation budget**

<b>G-6f: Covered plant surveys</b>	
199	Total covered plant occurrences protected, including the occurrences on existing open space, number protected by the Plan and the number created
9	Hours of covered plant surveying per occurrence per year
<b>G-6f: Townsend's Bat Maternity Colonies</b>	
\$0	Annual cost to monitor Townsend's bat maternity colonies
<b>G-6f: Species and Land Cover Type Added to Monitoring Base per year</b>	
2.2%	Percent of each species and/or land cover added each year beginning in year 1, assuming 45-year acquisition period.
<b>G-6f and G-6g: Cost Premium for Monitoring in First 10 years</b>	
15%	Percent premium on costs in years 1 - 10 to reflect more intensive early efforts and the fact that monitoring would become more efficient over time.
<b>G-6f: Biological monitoring contractors - hourly cost</b>	
\$101	Base cost per hour, Bay Area ES-II billing rate
\$198	Per diem including lodging (\$ per day)
\$26	Travel (\$ per day)
\$0	Miles assumed for travel
\$0.514	Dollars per mile for travel
8	Hours per day
\$127	Contractor cost per hour including amortized per diem and travel

**Table G-6h: California Tiger Salamander: Management plan, baseline genetic study, and on-going genetic monitoring for hybridization**

The objective of the management plan and baseline genetic study is to determine the percent of non-native genes in occupied sites (ponds/wetlands) and develop a management plan based on the data. The objectives of the on-going monitoring are to inform the adaptive management process associated with the Management Plan, evaluate effectiveness of management/restoration, and inform decision-making regarding CTS habitat restoration/acquisition.

<b>Assumptions / Notes:</b>	
215	total acres of CTS breeding habitat monitored by year 45, includes acquired reserve land and existing open space (Table 5-17)
	Year 15 Year 30 Year 45
Reserve system commitment by time period (Table 5-14)	30% 70% 100%
CTS breeding habitat (acres) acquired by time period, cumulative	65 151 215

Baseline study data collection will occur during the first 15 years of plan implementation due to the relatively low number of ponds/wetlands within the Reserve System at the onset of the permit.

Breeding habitat is added relatively evenly over time, and hybridization is only monitored within Reserve System lands.

If a habitat is occupied, genetic samples will be collected and that habitat will be sampled again every three years.

Three years of sampling are required to determine habitat as unoccupied.

Two people (Project Leader/Permitted Specialist and Senior Field Crew) are required for each potential breeding habitat site visit.

A field season includes time for the following activities: personnel management, project planning, data collection, data entry and management, and report writing.

30%	Percent of potential breeding habitat that is occupied habitat and therefore re-visited every three years for tissue collection purposes
20	Number of samples collected per occupied site
2	Number of pond/wetland sites visited per day, first 5 years
2.5	Number of sites visited per day, beginning in year 6
5	Days per year for project-related duties for Project Leader and for Senior Field Crew
\$140	Project Leader / Permitted Specialist, hourly rate
\$100	Senior Field Crew, hourly rate
\$150	Cost per sample for genetic testing, lab component
\$3,500	Annual cost for genetic testing: analysis and method design
\$3,500	Cost per period for collection equipment (waders, dip nets, buckets, etc.) years 1 - 5
\$2,500	Cost per period for collection equipment (waders, dip nets, buckets, etc.) years 6 - 15
\$3,500	Cost per period for tissue sampling equipment (collection jars, clippers, labels, notebooks, etc.) years 1 - 5
\$2,500	Cost per period for tissue sampling equipment (collection jars, clippers, labels, notebooks, etc.) years 6 - 15
15%	Percent of all occupied sites visited annually.
\$300	Annual cost for collection equipment (waders, nets, dip nets, buckets, etc.)
\$300	Annual cost for tissue sampling equipment (collection jars, clippers, labels, notebooks, etc.)

## Assumptions:

New potential breeding habitat acreage will continue to be added to the Reserve, so baseline monitoring will continue to determine occupancy and percent non-native gene frequencies.

Ponds/wetlands will be acquired/restored as part of the Conservation Plan, adding additional monitoring needs.

Representative ponds/wetlands will continue to be monitored at about the same frequency as with the hybridization/population monitoring.

All occupied sites will be visited and sampled on a regular basis, as stipulated by the Management Plan. For the purpose of this model, it is assumed occupied sites will be revisited every 5 years.

**G-6i: Monitoring enhancement for existing open space (County Parks and Open Space Authority lands)**

30%	percent of monitoring cost per acre required for monitoring enhancement of existing open space
-----	--

Monitoring activities begin in year 3

<b>G-6j: Directed Research</b>		Average annual funding required for directed research, per period.									
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45
		\$0	\$79,500	\$79,500	\$53,000	\$21,200	\$21,200	\$0	\$0	\$0	\$0
\$530,000	Directed research in Period 1-5 to investigate the feasibility of improving wildlife movement (Metcalf Canyon and Coyote Crk to Tulare Hill; Pajaro River between Santa Cruz Mts and Diablo Range; across Hwy 152 along Pacheco Creek.										

**G-6k: Scientific Review**

5	Members of Independent Conservation Assessment Team
\$5,300	Stipend per member per 5-year period
8	Members of Science Advisors panel
\$8,480	Stipend per member per 5-year period

## Notes:

Adaptive management experiments are covered under the monitoring staff and directed research categories.

Independent Conservation Assessment Team meets once every 4 years.

## G-7 Western Burrowing Owl Conservation Strategy

Management and monitoring costs for the Western Burrowing Owl conservation strategy were a late addition to the habitat plan.

Costs and detailed assumptions are shown on a separate sheet in the model--G-7.

Costs are summarized as a separate line item and are not integrated with other management and monitoring costs.

See Tables G-7a - e on G-7 Western Burrowing Owl sheet for detailed assumptions and notes.

## G-8 Contingency Fund (not including restoration contingency)

3%	Percent of total program funding, exclusive of acquisition capital budget and restoration budget, needed for contingency fund.
3%	Contingency factor for land acquisition (applied to land acquisition capital costs, including site improvements).

# Santa Clara Valley Habitat Plan Implementation Budget

Consumer Price Index -- All Urban Consumers  
U. S. Department of Labor, Bureau of Labor Statistics

data extracted September 9, 2008, update extracted April 13, 2010, update extracted June 23, 2011  
<http://www.bls.gov/cpi/data.htm>

**Series Id:** CUURA422SA0

Not Seasonally Adjusted

**Area:** San Francisco-Oakland-San Jose, CA

**Item:** All items

**Base Period:** 1982-84=100

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	HALF1	HALF2
1998		163.2		164.6		165.5		166.6		167.2		167.4	165.5	164.2	166.9
1999		169.4		172.2		171.8		173.5		175.2		174.5	172.5	170.8	174.2
2000		176.5		178.7		179.1		181.7		183.4		184.1	180.2	177.7	182.6
2001		187.9		189.1		190.9		191		191.7		190.6	189.9	188.7	191.1
2002		191.3		193		193.2		193.5		194.3		193.2	193	192.3	193.7
2003		197.7		197.3		196.3		196.3		196.3		195.3	196.4	196.8	196.1
2004		198.1		198.3		199		198.7		200.3		199.5	198.8	198.2	199.5
2005		201.2		202.5		201.2		203		205.9		203.4	202.7	201.5	203.9
2006		207.1		208.9		209.1		210.7		211		210.4	209.2	207.9	210.6
2007		213.688		215.842		216.123		216.24		217.949		218.485	216.048	214.736	217.361
2008		219.612		222.074		225.181		225.411		225.824		218.528	222.767	221.73	223.804
2009		222.166		223.854		225.692		225.801		226.051		224.239	224.395	223.305	225.484
2010		226.145		227.697		228.110		227.954		228.107		227.658	227.469	226.994	227.944
2011		229.981		234.121											

original costs derived in mid 2007

1.03735  
1.01071

conversion to 2008

1.040

1.030

conversion to 2009

1.040

1.040

conversion to 2010

1.060

1.050

# Santa Clara Valley Habitat Plan Implementation Budget

**Table 9-1: Summary of Santa Clara Valley Habitat Plan Implementation Budget**

## Final Plan

**2010 dollars**

**Total Budget (not rounded)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition	\$3,730,458	\$27,382,871	\$31,015,677	\$31,015,677	\$31,015,677	\$31,015,677	\$31,015,677	\$31,015,677	\$31,015,677	\$30,691,529	\$0	\$278,914,593	\$5,578,292
Reserve Management and Maintenance	\$0	\$3,746,940	\$8,582,687	\$8,922,591	\$10,138,445	\$9,943,604	\$10,921,865	\$10,720,453	\$10,663,043	\$10,990,100	\$10,740,898	\$95,370,626	\$1,907,413
Monitoring, Research, and Scientific Review	\$0	\$2,142,219	\$2,180,097	\$2,596,197	\$2,409,515	\$2,805,411	\$2,963,253	\$3,348,468	\$3,604,497	\$4,042,633	\$4,144,294	\$30,236,583	\$604,732
Western Burrowing Owl Conservation Strategy	\$0	\$316,324	\$699,604	\$581,244	\$806,424	\$773,044	\$1,015,844	\$924,364	\$1,208,904	\$1,101,764	\$1,142,244	\$8,569,760	\$171,395
Habitat Restoration/Creation	\$0	\$10,418,652	\$10,751,614	\$10,998,226	\$11,230,300	\$11,331,300	\$11,391,045	\$11,487,593	\$11,342,652	\$1,849,119	\$1,828,120	\$92,628,622	\$1,852,572
Program Administration	\$328,347	\$3,735,933	\$3,982,673	\$4,219,351	\$4,349,786	\$4,586,432	\$4,654,442	\$4,797,565	\$4,967,993	\$5,166,723	\$5,091,791	\$45,881,037	\$917,621
Contingency Fund	\$112,492	\$1,009,954	\$1,275,904	\$1,295,566	\$1,332,697	\$1,338,886	\$1,379,057	\$1,382,406	\$1,396,352	\$1,407,504	\$482,412	\$12,413,231	\$248,265
<b>Total</b>	<b>\$4,171,297</b>	<b>\$48,752,894</b>	<b>\$58,488,256</b>	<b>\$59,628,851</b>	<b>\$61,282,843</b>	<b>\$61,794,354</b>	<b>\$63,341,183</b>	<b>\$63,676,526</b>	<b>\$64,199,117</b>	<b>\$55,249,371</b>	<b>\$23,429,760</b>	<b>\$564,014,453</b>	<b>\$11,280,289</b>

**Capital Budget (not rounded)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: acquisition and site improvements	\$3,600,000	\$26,316,747	\$29,879,647	\$29,879,647	\$29,879,647	\$29,879,647	\$29,879,647	\$29,879,647	\$29,879,647	\$29,555,499	\$0	\$268,629,776	\$5,372,596
Reserve Management and Maintenance: vehicles, equipment, and facilities	\$0	\$1,507,959	\$1,519,595	\$1,632,754	\$2,306,464	\$1,843,163	\$2,486,714	\$2,016,840	\$2,057,680	\$2,149,130	\$1,899,929	\$19,420,228	\$388,405
Monitoring & Research: equipment and vehicles	\$0	\$9,392	\$6,643	\$16,663	\$8,833	\$20,409	\$8,409	\$17,441	\$8,409	\$20,409	\$8,409	\$125,016	\$2,500
Western Burrowing Owl Conservation Strategy	\$0	\$12,200	\$12,200	\$5,000	\$12,200	\$12,200	\$5,000	\$12,200	\$12,200	\$5,000	\$12,200	\$100,400	\$2,008
Habitat Restoration/Creation: construction, office equipment, and vehicles	\$0	\$9,403,397	\$9,400,866	\$9,420,681	\$9,409,258	\$9,431,795	\$9,413,076	\$9,431,160	\$9,417,635	\$53,952	\$32,953	\$75,414,770	\$1,508,295
Program Administration: equipment purchases	\$19,292	\$76,765	\$52,071	\$69,833	\$53,166	\$91,814	\$51,926	\$71,250	\$52,954	\$90,785	\$52,954	\$682,810	\$13,656
Contingency, land acquisition and site improvements	\$108,000	\$789,502	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$886,665	\$0	\$8,058,893	\$161,178
<b>Total</b>	<b>\$3,727,292</b>	<b>\$38,115,962</b>	<b>\$41,767,411</b>	<b>\$41,920,968</b>	<b>\$42,565,959</b>	<b>\$42,175,416</b>	<b>\$42,741,161</b>	<b>\$42,324,927</b>	<b>\$42,324,914</b>	<b>\$32,761,439</b>	<b>\$2,006,445</b>	<b>\$372,431,894</b>	<b>\$7,448,638</b>
Land acquisition cost per acre acquired												<b>\$7,400</b>	
Restoration cost per acre restored (not including stream restoration)												<b>\$81,000</b>	

**Operational Budget (not rounded)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: transaction costs	\$130,458	\$1,066,124	\$1,136,029	\$1,136,029	\$1,136,029	\$1,136,029	\$1,136,029	\$1,136,029	\$1,136,029	\$1,136,029	\$0	\$10,284,817	\$205,696
Reserve Management and Maintenance: facility, vehicle, and equipment maintenance and personnel	\$0	\$2,238,981	\$7,063,092	\$7,289,836	\$7,831,980	\$8,100,441	\$8,435,152	\$8,703,612	\$8,605,363	\$8,840,970	\$8,840,970	\$75,950,398	\$1,519,008
Monitoring, Research, and Scientific Review	\$0	\$2,132,828	\$2,173,454	\$2,579,533	\$2,400,681	\$2,785,003	\$2,954,844	\$3,331,028	\$3,596,087	\$4,022,224	\$4,135,884	\$30,111,567	\$602,231
Western Burrowing Owl Conservation Strategy	\$0	\$304,124	\$687,404	\$576,244	\$794,224	\$760,844	\$1,010,844	\$912,164	\$1,196,704	\$1,096,764	\$1,130,044	\$8,469,360	\$169,387
Habitat Restoration/Creation: vehicle maintenance and personnel, long-term management/monitoring	\$0	\$1,015,256	\$1,350,748	\$1,577,545	\$1,821,042	\$1,899,506	\$1,977,970	\$2,056,434	\$1,925,017	\$1,795,167	\$1,795,167	\$17,213,852	\$344,277
Program Administration: personnel, legal and financial assistance, insurance, ED's discretionary budget, in-lieu funding	\$309,055	\$3,659,168	\$3,930,603	\$4,149,519	\$4,296,619	\$4,494,618	\$4,602,517	\$4,726,315	\$4,915,039	\$5,075,937	\$5,038,837	\$45,198,227	\$903,965
Operating Contingency Fund	\$4,492	\$220,451	\$379,515	\$399,177	\$436,307	\$442,497	\$482,668	\$486,017	\$499,963	\$520,839	\$482,412	\$4,354,338	\$87,087
<b>Total</b>	<b>\$444,005</b>	<b>\$10,636,932</b>	<b>\$16,720,845</b>	<b>\$17,707,883</b>	<b>\$18,716,884</b>	<b>\$19,618,938</b>	<b>\$20,600,022</b>	<b>\$21,351,599</b>	<b>\$21,874,203</b>	<b>\$22,487,931</b>	<b>\$21,423,315</b>	<b>\$191,582,559</b>	<b>\$3,831,651</b>
<b>Average Annual Cost per Acre Acquired and Managed, New Reserve System</b>		<b>\$553</b>	<b>\$329</b>	<b>\$237</b>	<b>\$191</b>	<b>\$162</b>	<b>\$144</b>	<b>\$129</b>	<b>\$116</b>	<b>\$107</b>	<b>\$101</b>		
<b>Average Annual Cost per Acre Managed, Existing Open Space</b>		<b>\$2</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$72</b>		

Detail may not add to total due to rounding at various stages of the calculations.



# Santa Clara Valley Habitat Plan Implementation Budget

**Table 9-1: Summary of Santa Clara Valley Habitat Plan Implementation Budget**

**Final Plan**

**2010 dollars**

**Total Budget (rounded to the nearest \$10,000)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition	\$3,730,000	\$27,380,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$31,020,000	\$30,690,000	\$0	\$278,940,000	\$5,580,000
Reserve Management and Maintenance	\$0	\$3,750,000	\$8,580,000	\$8,920,000	\$10,140,000	\$9,940,000	\$10,920,000	\$10,720,000	\$10,660,000	\$10,990,000	\$10,740,000	\$95,360,000	\$1,910,000
Monitoring, Research, and Scientific Review	\$0	\$2,140,000	\$2,180,000	\$2,600,000	\$2,410,000	\$2,810,000	\$2,960,000	\$3,350,000	\$3,600,000	\$4,040,000	\$4,140,000	\$30,230,000	\$600,000
Western Burrowing Owl Conservation Strategy	\$0	\$320,000	\$700,000	\$580,000	\$810,000	\$770,000	\$1,020,000	\$920,000	\$1,210,000	\$1,100,000	\$1,140,000	\$8,570,000	\$170,000
Habitat Restoration/Creation	\$0	\$10,420,000	\$10,750,000	\$11,000,000	\$11,230,000	\$11,330,000	\$11,390,000	\$11,490,000	\$11,340,000	\$1,850,000	\$1,830,000	\$92,630,000	\$1,850,000
Program Administration	\$330,000	\$3,740,000	\$3,980,000	\$4,220,000	\$4,350,000	\$4,590,000	\$4,650,000	\$4,800,000	\$4,970,000	\$5,170,000	\$5,090,000	\$45,890,000	\$920,000
Contingency Fund	\$110,000	\$1,010,000	\$1,280,000	\$1,300,000	\$1,330,000	\$1,340,000	\$1,380,000	\$1,380,000	\$1,400,000	\$1,410,000	\$480,000	\$12,420,000	\$250,000
<b>Total</b>	<b>\$4,170,000</b>	<b>\$48,760,000</b>	<b>\$58,490,000</b>	<b>\$59,640,000</b>	<b>\$61,290,000</b>	<b>\$61,800,000</b>	<b>\$63,340,000</b>	<b>\$63,680,000</b>	<b>\$64,200,000</b>	<b>\$55,250,000</b>	<b>\$23,420,000</b>	<b>\$564,040,000</b>	<b>\$11,280,000</b>

**Capital Budget (rounded to the nearest \$10,000)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: acquisition and site improvements	\$3,600,000	\$26,320,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,880,000	\$29,560,000	\$0	\$268,640,000	\$5,370,000
Reserve Management and Maintenance: vehicles, equipment, and facilities	\$0	\$1,510,000	\$1,520,000	\$1,630,000	\$2,310,000	\$1,840,000	\$2,490,000	\$2,020,000	\$2,060,000	\$2,150,000	\$1,900,000	\$19,430,000	\$390,000
Monitoring & Research: equipment and vehicles	\$0	\$10,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$20,000	\$10,000	\$140,000	\$3,000
Western Burrowing Owl Conservation Strategy	\$0	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$100,000	\$2,000
Habitat Restoration/Creation: construction, office equipment, and vehicles	\$0	\$9,400,000	\$9,400,000	\$9,420,000	\$9,410,000	\$9,430,000	\$9,410,000	\$9,430,000	\$9,420,000	\$50,000	\$30,000	\$75,400,000	\$1,510,000
Program Administration: equipment purchases	\$20,000	\$80,000	\$50,000	\$70,000	\$50,000	\$90,000	\$50,000	\$70,000	\$50,000	\$90,000	\$50,000	\$670,000	\$10,000
Contingency, land acquisition and site improvements	\$110,000	\$790,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$890,000	\$0	\$8,090,000	\$160,000
<b>Total</b>	<b>\$3,730,000</b>	<b>\$38,120,000</b>	<b>\$41,770,000</b>	<b>\$41,930,000</b>	<b>\$42,570,000</b>	<b>\$42,170,000</b>	<b>\$42,750,000</b>	<b>\$42,330,000</b>	<b>\$42,330,000</b>	<b>\$32,770,000</b>	<b>\$2,000,000</b>	<b>\$372,470,000</b>	<b>\$7,445,000</b>
Land acquisition cost per acre acquired												<b>\$7,400</b>	
Restoration cost per acre restored (not including stream restoration)												<b>\$81,000</b>	

**Operational Budget (rounded to the nearest \$10,000)**

Budget Category	Total Cost per Implementation Period (Years)											Total	Annual Average
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition: transaction costs	\$130,000	\$1,070,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$1,140,000	\$0	\$10,320,000	\$210,000
Reserve Management and Maintenance: facility, vehicle, and equipment maintenance and personnel	\$0	\$2,240,000	\$7,060,000	\$7,290,000	\$7,830,000	\$8,100,000	\$8,440,000	\$8,700,000	\$8,610,000	\$8,840,000	\$8,840,000	\$75,950,000	\$1,520,000
Monitoring, Research, and Scientific Review	\$0	\$2,130,000	\$2,170,000	\$2,580,000	\$2,400,000	\$2,790,000	\$2,950,000	\$3,330,000	\$3,600,000	\$4,020,000	\$4,140,000	\$30,110,000	\$600,000
Western Burrowing Owl Conservation Strategy	\$0	\$300,000	\$690,000	\$580,000	\$790,000	\$760,000	\$1,010,000	\$910,000	\$1,200,000	\$1,100,000	\$1,130,000	\$8,470,000	\$170,000
Habitat Restoration/Creation: vehicle maintenance and personnel, long-term management/monitoring	\$0	\$1,020,000	\$1,350,000	\$1,580,000	\$1,820,000	\$1,900,000	\$1,980,000	\$2,060,000	\$1,930,000	\$1,800,000	\$1,800,000	\$17,240,000	\$340,000
Program Administration: personnel, legal and financial assistance, insurance, ED's discretionary budget, in-lieu funding	\$310,000	\$3,660,000	\$3,930,000	\$4,150,000	\$4,300,000	\$4,490,000	\$4,600,000	\$4,730,000	\$4,920,000	\$5,080,000	\$5,040,000	\$45,210,000	\$900,000
Operating Contingency Fund	\$0	\$220,000	\$380,000	\$400,000	\$440,000	\$440,000	\$480,000	\$490,000	\$500,000	\$520,000	\$480,000	\$4,350,000	\$90,000
<b>Total</b>	<b>\$440,000</b>	<b>\$10,640,000</b>	<b>\$16,720,000</b>	<b>\$17,720,000</b>	<b>\$18,720,000</b>	<b>\$19,620,000</b>	<b>\$20,600,000</b>	<b>\$21,360,000</b>	<b>\$21,900,000</b>	<b>\$22,500,000</b>	<b>\$21,430,000</b>	<b>\$191,650,000</b>	<b>\$3,830,000</b>
<b>Average Annual Cost per Acre Managed, New Reserve System</b>		<b>\$553</b>	<b>\$329</b>	<b>\$237</b>	<b>\$191</b>	<b>\$162</b>	<b>\$144</b>	<b>\$129</b>	<b>\$116</b>	<b>\$107</b>	<b>\$101</b>		
<b>Average Annual Cost per Acre Managed, Existing Open Space</b>		<b>\$2</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$71</b>	<b>\$72</b>		

Detail may not add to total due to rounding at various stages of the calculations.



## Summary of Santa Clara Valley Habitat Plan Staffing

	Total cost per FTE per year	Number of FTEs										
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
<b>Administrative personnel</b>												
Administrative Director	\$171,720	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
IT - Database / GIS Management	\$103,032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Budget Analyst	\$100,170	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Grant Specialist	\$121,635	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Public Education & Outreach	\$85,860	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Administrative Assistant	\$71,550	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total administrative personnel		1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
<b>Shared personnel (administration, restoration, reserve management, and monitoring)</b>												
Senior Scientist	\$135,945	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Project Manager/Conservation Planner	\$121,635	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Field Staff	\$93,015	0.0	1.5	3.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total shared personnel		0.0	3.0	4.5	5.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
<b>Reserve management and maintenance personnel</b>												
Reserve Manager	\$121,635	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Laborer	\$71,550	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administrative Assistant	\$71,550	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total reserve personnel		0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
<b>Total HCP/NCCP personnel</b>		<b>1.5</b>	<b>7.0</b>	<b>8.5</b>	<b>9.5</b>	<b>10.5</b>	<b>10.5</b>	<b>10.5</b>	<b>10.5</b>	<b>10.5</b>	<b>10.5</b>	<b>10.5</b>

**Notes:**

Total cost per FTE per year includes the costs for salaries and benefits.

Costs for shared personnel are divided between the habitat restoration, reserve management, and monitoring cost categories according to the following percentage allocation:

- Program administration: 10%
- Reserve management: 35%
- Restoration: 35%
- Monitoring and research: 20%

Santa Clara Valley Habitat Plan Implementation Budget

**Table 9-3: Summary of Management and Monitoring Costs on an Annual Basis per Acre - Santa Clara Valley Habitat Plan Implementation Budget**

**Final Plan**

**2010 dollars**

**Total Budget (not rounded)**

Budget Category	Average Annual Cost per Implementation Period										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve Management and Maintenance	\$0	\$798,212	\$1,840,376	\$1,884,580	\$2,184,458	\$2,132,053	\$2,381,280	\$2,329,253	\$2,373,038	\$2,418,557	\$2,370,157
<b>Total Reserve Management Cost</b>	\$0	\$798,212	\$1,840,376	\$1,884,580	\$2,184,458	\$2,132,053	\$2,381,280	\$2,329,253	\$2,373,038	\$2,418,557	\$2,370,157
<b>Total Reserve Management Cost Per Acre on Land Acquired</b>	na	\$210	\$127	\$88	\$86	\$66	\$66	\$55	\$49	\$45	\$44
<b>Total Reserve Management Cost Per Acre on Existing Open Space</b>	na	\$0	\$66	\$66	\$66	\$66	\$66	\$66	\$66	\$66	\$66
Monitoring, Research, and Scientific Review	\$0	\$460,704	\$487,739	\$583,872	\$551,013	\$653,102	\$695,804	\$782,445	\$851,440	\$937,531	\$964,520
<b>Total Monitoring Cost Per Acre on Land Acquired</b>	na	\$113	\$55	\$46	\$32	\$31	\$28	\$27	\$26	\$25	\$26
<b>Total Monitoring Cost Per Acre on Existing Open Space</b>	na	\$2	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$6
Land Acquired and Managed for Reserve System	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Existing Open Space Managed for Reserve System	-	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291
<b>Total Reserve Acres</b>	-	<b>17,086</b>	<b>20,881</b>	<b>24,675</b>	<b>28,470</b>	<b>32,265</b>	<b>36,060</b>	<b>39,854</b>	<b>43,649</b>	<b>47,444</b>	<b>47,444</b>

Assumptions / Notes:

Management activities on existing open space begin in year 6.

Monitoring activities on existing open space begin in year 3.

Detail may not add to total due to rounding at various stages of the calculations.

Santa Clara Valley Habitat Plan Implementation Budget

**Table 9-3: Summary of Management and Monitoring Costs on an Annual Basis per Acre - Santa Clara Valley Habitat Plan Implementation Budget**

**Final Plan**

**2010 dollars**

**Total Budget (rounded to the nearest \$10,000)**

Budget Category	Average Annual Cost per Implementation Period										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve Management and Maintenance	\$0	\$800,000	\$1,840,000	\$1,880,000	\$2,180,000	\$2,130,000	\$2,380,000	\$2,330,000	\$2,370,000	\$2,420,000	\$2,370,000
<b>Total Reserve Management Cost</b>	\$0	\$800,000	\$1,840,000	\$1,880,000	\$2,180,000	\$2,130,000	\$2,380,000	\$2,330,000	\$2,370,000	\$2,420,000	\$2,370,000
<b>Total Reserve Management Cost Per Acre on Land Acquired</b>	na	\$211	\$127	\$88	\$86	\$66	\$66	\$55	\$49	\$45	\$44
<b>Total Reserve Management Cost Per Acre on Existing Open Space</b>	na	\$0	\$66	\$66	\$66	\$66	\$66	\$66	\$66	\$66	\$66
Monitoring, Research, and Scientific Review	\$0	\$460,000	\$490,000	\$580,000	\$550,000	\$650,000	\$700,000	\$780,000	\$850,000	\$940,000	\$960,000
<b>Total Monitoring Cost Per Acre on Land Acquired</b>	na	\$113	\$56	\$45	\$32	\$31	\$28	\$27	\$26	\$25	\$26
<b>Total Monitoring Cost Per Acre on Existing Open Space</b>	na	\$2	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$5	\$6
Land Acquired and Managed for Reserve System	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Existing Open Space Managed for Reserve System	-	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291	13,291
<b>Total Reserve Acres</b>	-	<b>17,086</b>	<b>20,881</b>	<b>24,675</b>	<b>28,470</b>	<b>32,265</b>	<b>36,060</b>	<b>39,854</b>	<b>43,649</b>	<b>47,444</b>	<b>47,444</b>

Assumptions / Notes:

Management activities on existing open space begin in year 6.

Monitoring activities on existing open space begin in year 3.

Detail may not add to total due to rounding at various stages of the calculations.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table 9-4: Santa Clara Valley Habitat Plan Implementation Budget: Annual Average Costs Beyond Permit Term**

**Final Plan**

**2010 dollars**

<b>Total Budget (not rounded)</b>	<b>All Reserve Lands</b>	<b>Restored Wetlands</b>
<b>Budget Category</b>	<b>Annual Average Cost</b>	<b>Annual Average Cost</b>
Land Acquisition	\$0	\$0
Reserve Management and Maintenance	\$1,711,411	\$36,473
Monitoring - Species and Habitat	\$279,622	\$26,721
Western Burrowing Owl Conservation Strategy	\$228,449	\$0
Habitat Restoration/Creation	\$0	\$0
Program Administration	\$651,413	\$0
Contingency Fund	\$0	\$0
<b>Total</b>	<b>\$2,870,895</b>	<b>\$63,194</b>
<b>Capital Budget (not rounded)</b>		
<b>Budget Category</b>	<b>Annual Average Cost</b>	<b>Annual Average Cost</b>
Land Acquisition: acquisition and site improvements	\$0	\$0
Reserve Management and Maintenance: vehicles, equipment, and facilities	\$116,587	\$0
Monitoring: equipment and vehicles	\$636	\$0
Western Burrowing Owl Conservation Strategy	\$2,440	\$0
Habitat Restoration/Creation: construction, office equipment, and vehicles	\$0	\$0
Program Administration: equipment purchases	\$11,935	\$0
Contingency, land acquisition and site improvements	\$0	\$0
<b>Total</b>	<b>\$131,598</b>	<b>\$0</b>
<b>Operational Budget (not rounded)</b>		
<b>Budget Category</b>	<b>Annual Average Cost</b>	<b>Annual Average Cost</b>
Land Acquisition: transaction costs	\$0	\$0
Reserve Management and Maintenance: facility, vehicle, and equipment maintenance and personnel	\$1,594,824	\$36,473
Monitoring - Species and Habitat	\$278,986	\$26,721
Western Burrowing Owl Conservation Strategy	\$226,009	\$0
Habitat Restoration/Creation: vehicle maintenance and personnel	\$0	\$0
Program Administration: personnel, legal and financial assistance, insurance, ED's discretionary budget, in-lieu funding	\$639,478	\$0
Operating Contingency Fund	\$0	\$0
<b>Total</b>	<b>\$2,739,297</b>	<b>\$63,194</b>
Land Acquired and Managed for Reserve System	34,153	
Existing Open Space Managed for Reserve System	13,291	
<b>Total Acres Managed / Wetlands Restored</b>	<b>47,444</b>	<b>506.3</b>
<b>Average Annual Cost per Acre Managed, New Reserve System</b>	<b>\$50</b>	<b>\$120</b>
<b>Average Annual Cost per Acre Managed, Existing Open Space</b>	<b>\$70</b>	

Notes / Comments:

Acquisition complete by year 45.  
Replacement period doubled. No other capital costs post-permit.

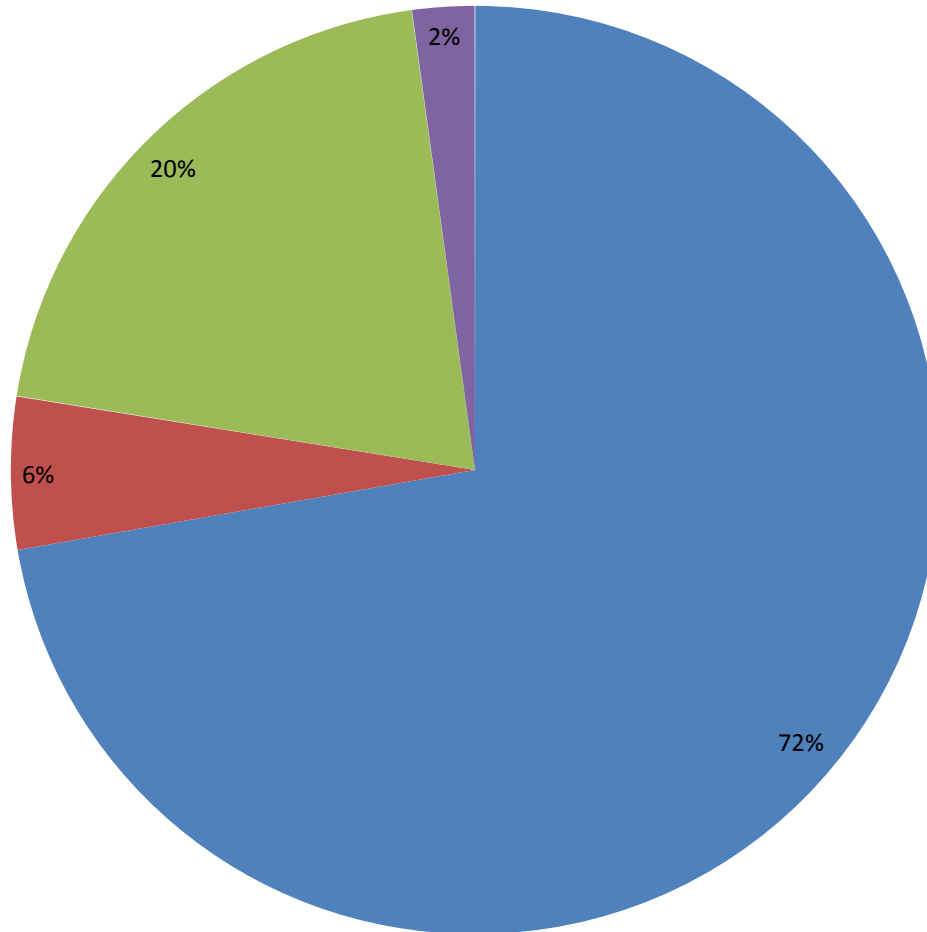
Restoration complete in year 45.  
Replacement period doubled.  
Not required post-permit.

Acquisition complete by year 45.  
Reserve planning at 50% of annual cost in year 50. Other reserve management at 100% of annual cost in year 50. Includes cost to manage land acquired for the Reserve as well as existing open space.  
Includes monitoring on land acquired for the Reserve as well as on existing open space.

Restoration complete by year 45.  
Public education and outreach at 50% of annual cost in year 50. Other administration at reduced staffing plus 100 percent of per employee cost. Equipment and furniture replacement period and upgrade cycle doubled.  
Not required post-permit.

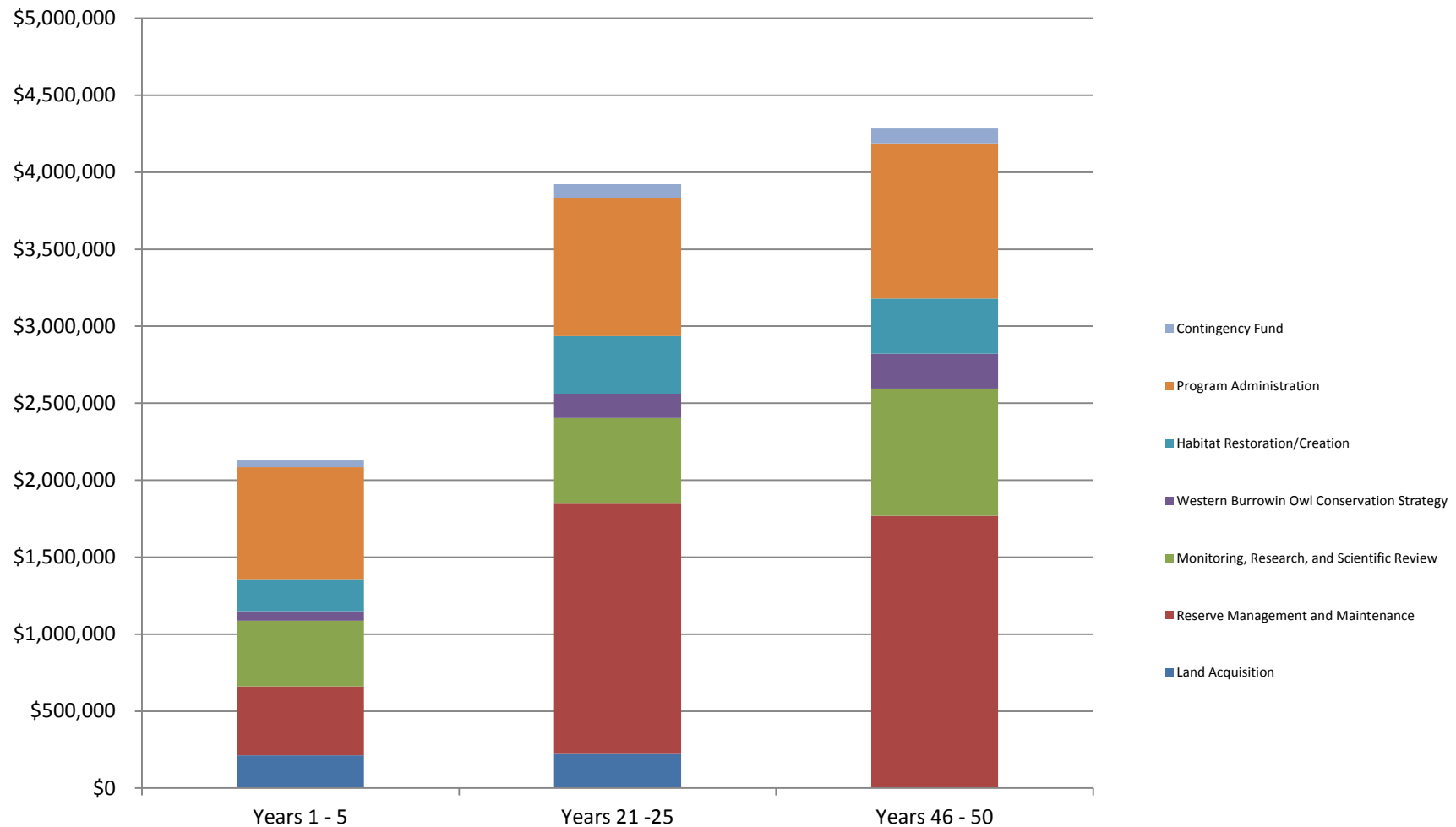
## Capital Budget through Year 50, by Category, Santa Clara Valley Habitat Plan - Final

Land Acquisition Management and Monitoring Habitat Restoration/Creation Contingency Fund



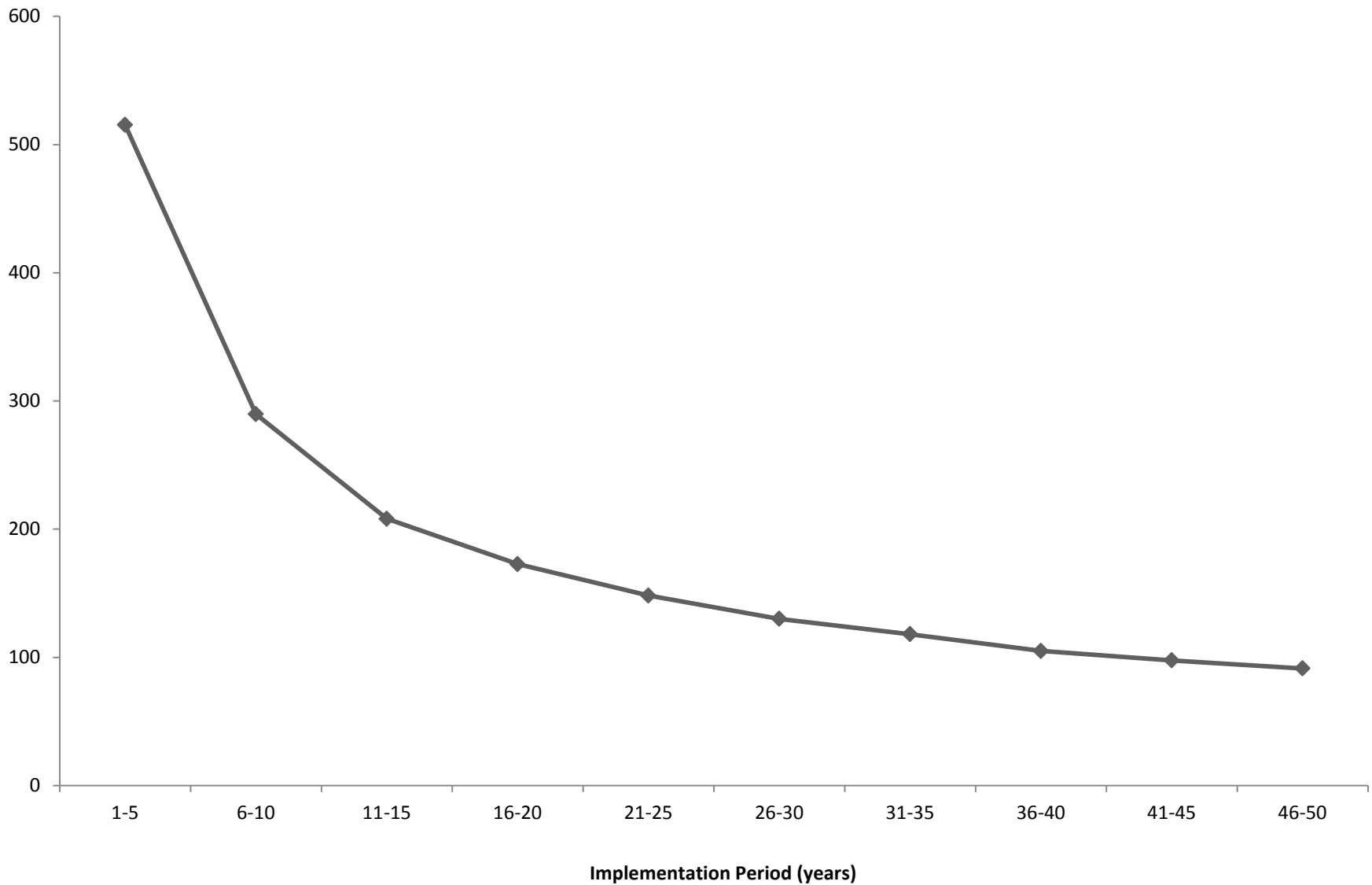
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## Annual Average Operating Budget by Category, Selected Implementation Periods, Santa Clara Valley Habitat Plan - Final



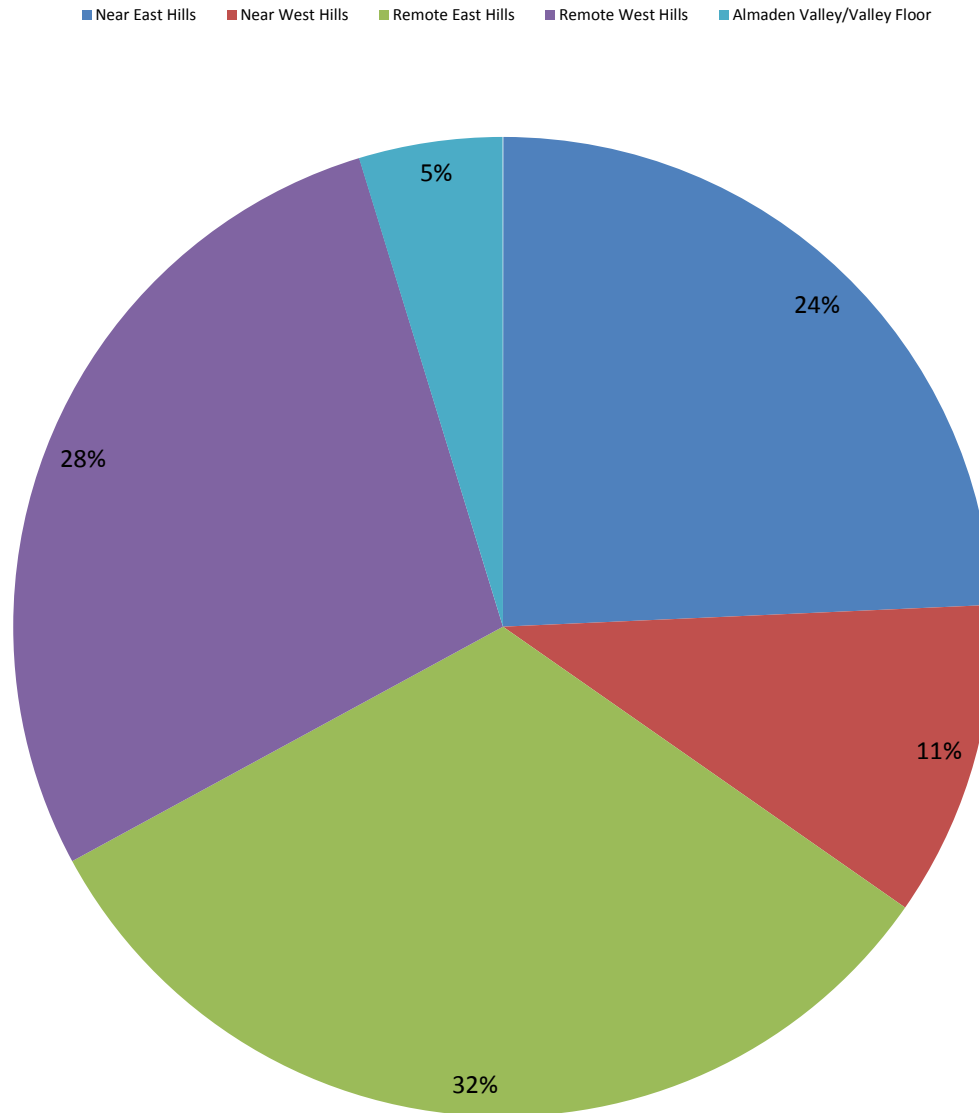
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## Average Annual Cost per Acre Managed, by Implementation Period, Santa Clara Valley Habitat Plan - Final



App\_G-1\_BudgetModel\_2010-dollars\_August 2012 FINAL

## Reserve Acres by Location, Santa Clara Valley Habitat Plan - Final



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**Table G-0b: Reserve Area Acquired (input by location and parcel size from SCV Habitat Plan database)**  
**Final Plan**

Location	Acres by location and parcel size				Percent of Total by Location	Easements (acres)
	Less than 50 acres	50 - 250 acres	Over 250 acres	Total		
Near East Hills	300	2,290	6,180	8,770	24%	4,385
Near West Hills	270	640	2,850	3,760	10%	1,880
Remote East Hills	20	1,920	9,740	11,680	32%	5,840
Remote West Hills	10	820	9,350	10,180	28%	5,090
Almaden Valley/Valley Floor	80	390	1,240	1,710	5%	-
<b>Total</b>	<b>680</b>	<b>6,060</b>	<b>29,360</b>	<b>36,100</b>	<b>100%</b>	na
<b>Percent of Total by Parcel Size</b>	<b>2%</b>	<b>17%</b>	<b>81%</b>	<b>100%</b>		<b>17,195</b>
percent of total acquisition						48%

Assumptions / Notes:

The number of acres acquired is greater than the Reserve Area Managed (Table G-0d) because the Plan also includes requirements (e.g., connectivity, protection of plant occurrences) that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0c: Restoration or Creation Requirements for Selected Land Cover Types in SCV Habitat Plan Reserves (Source: Tables 5-12 and 5-14)**

Acquisition simply assumed to occur in

## Final Plan

Land Cover Type Restored/Created by Time Period	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
<b>Land Cover Type (acres except where noted)</b>												
Willow Riparian Forest & Scrub, Mixed Riparian Forest & Woodland	0.0	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	0.0	0.0	339.0
Central California Sycamore Alluvial Woodland	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	14.0
Coastal and Valley Freshwater Marsh	0.0	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	0.0	0.0	45.0
Seasonal Wetland	0.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	0.0	0.0	30.0
Ponds	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	72.0
<b>Subtotal (acres)</b>	<b>0.0</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>62.5</b>	<b>0.0</b>	<b>0.0</b>	<b>500.0</b>
Streams (miles)	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0	10.4
<b>Total (acres)</b>	<b>0.0</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>0.0</b>	<b>0.0</b>	<b>506.3</b>
Assumptions / Notes:												
	12.50%	% of each land cover type restored in each 5-year period from year 1 through year 40										
	5	width of stream (in feet) used to calculate total acres restored										

Detail may not add to total due to rounding at various stages of the calculations.

Restoration / Creation Requirements		
	For Impacts	To Contribute to Recovery
	Table 5-12	Table 5-14
339.0	289.0	50.0
14.0	14.0	-
45.0	25.0	20.0
30.0	30.0	-
72.0	52.0	20.0
500.0	410.0	90.0
10.4	9.4	1.0
506.3	415.7	90.6

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0d: Reserve Area Acquired and Managed by Land Cover Type (Source: Table 5-13)**

## Final Plan

Land Cover Type (acres except where noted)	Unit	Acquired and Managed (input value)
California Annual Grassland	acres	13,300
Serpentine Bunchgrass Grassland	acres	4,000
Serpentine Rock Outcrop / Barrens	acres	120
Serpentine Seep	acres	10
Rock Outcrop	acres	10
Northern Mixed Chaparral / Chamise Chaparral	acres	400
Mixed Serpentine Chaparral	acres	700
Northern Coastal Scrub / Diablan Sage Scrub	acres	1,400
Valley Oak Woodland	acres	1,700
Mixed Oak Woodland and Forest	acres	7,100
Blue Oak Woodland	acres	1,100
Coast Live Oak Forest and Woodland	acres	2,900
Foothill Pine - Oak Woodland	acres	80
Mixed Evergreen Forest	acres	20
Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland	acres	917
Central California Sycamore Alluvial Woodland	acres	54
Redwood Forest	acres	10
Ponderosa Pine Woodland	acres	0
Knobcone Pine Woodland	acres	0
Coastal and Valley Freshwater Marsh	acres	95
Seasonal Wetland	acres	60
Pond	acres	177
<b>Total</b>	<b>acres</b>	<b>34,153</b>
<b>Streams (overlay, included in acres above)</b>	<b>miles</b>	<b>110.4</b>

Note: Actual acquisitions of Reserve System lands are likely to be greater than the minimum necessary to contribute to the recovery of covered species because the Plan also includes requirements (e.g., connectivity, protection of plant occurrences) that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types. The numbers presented in this table represent a hypothetical Reserve System that would meet the requirements of the Plan. Restored /created habitat is counted in the wetland land cover to which is it restored, generally from grassland.

**Table G-0d1: Reserve Area Acquired by Land Cover Type by Time Period**

Land Cover Type	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
California Annual Grassland	-	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478	-	13,300
Serpentine Bunchgrass Grassland	-	444	444	444	444	444	444	444	444	444	-	4,000
Serpentine Rock Outcrop / Barrens	-	13	13	13	13	13	13	13	13	13	-	120
Serpentine Seep	-	1	1	1	1	1	1	1	1	1	-	10
Rock Outcrop	-	1	1	1	1	1	1	1	1	1	-	10
Northern Mixed Chaparral / Chamise Chaparral	-	44	44	44	44	44	44	44	44	44	-	400
Mixed Serpentine Chaparral	-	78	78	78	78	78	78	78	78	78	-	700
Northern Coastal Scrub / Diablan Sage Scrub	-	156	156	156	156	156	156	156	156	156	-	1,400
Valley Oak Woodland	-	189	189	189	189	189	189	189	189	189	-	1,700
Mixed Oak Woodland and Forest	-	789	789	789	789	789	789	789	789	789	-	7,100
Blue Oak Woodland	-	122	122	122	122	122	122	122	122	122	-	1,100
Coast Live Oak Forest and Woodland	-	322	322	322	322	322	322	322	322	322	-	2,900
Foothill Pine - Oak Woodland	-	9	9	9	9	9	9	9	9	9	-	80
Mixed Evergreen Forest	-	2	2	2	2	2	2	2	2	2	-	20
Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland	-	102	102	102	102	102	102	102	102	102	-	917
Central California Sycamore Alluvial Woodland	-	6	6	6	6	6	6	6	6	6	-	54
Redwood Forest	-	1	1	1	1	1	1	1	1	1	-	10
Ponderosa Pine Woodland	-	-	-	-	-	-	-	-	-	-	-	-
Knobcone Pine Woodland	-	0	0	0	0	0	0	0	0	0	-	0
Coastal and Valley Freshwater Marsh	-	11	11	11	11	11	11	11	11	11	-	95
Seasonal Wetland	-	7	7	7	7	7	7	7	7	7	-	60
Pond	-	20	20	20	20	20	20	20	20	20	-	177
<b>Total acres</b>	-	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	<b>3,795</b>	-	<b>34,153</b>
<b>Total stream miles (overlay)</b>	-	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	-	<b>110</b>
Assumptions / Notes:												

Actual acquisitions of Reserve System lands is likely to be greater than the minimum necessary to contribute to the recovery of covered species because the Plan also includes requirements (e.g., connectivity, protection of plant occurrences) that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types. The numbers presented in this table represent a hypothetical Reserve System that would meet the requirements of the Plan.

11.11% % of each land cover type acquired in each 5-year period beginning in year 1.  
5 width of stream (in feet) used to calculate total acres acquired / managed

Detail may not add to total due to rounding at various stages of the calculations.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-0d: Reserve Area Acquired and Managed by Land Cover Type (Source: Table 5-13)**

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**Table G-0d2: Reserve Area Managed by Land Cover Type (cumulative)**

Land Cover Type (acres except where noted)	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
California Annual Grassland	-	1,478	2,956	4,433	5,911	7,389	8,867	10,344	11,822	13,300	13,300	13,300
Serpentine Bunchgrass Grassland	-	444	889	1,333	1,778	2,222	2,667	3,111	3,556	4,000	4,000	4,000
Serpentine Rock Outcrop / Barrens	-	13	27	40	53	67	80	93	107	120	120	120
Serpentine Seep	-	1	2	3	4	6	7	8	9	10	10	10
Rock Outcrop	-	1	2	3	4	6	7	8	9	10	10	10
Northern Mixed Chaparral / Chamise Chaparral	-	44	89	133	178	222	267	311	356	400	400	400
Mixed Serpentine Chaparral	-	78	156	233	311	389	467	544	622	700	700	700
Northern Coastal Scrub / Diablan Sage Scrub	-	156	311	467	622	778	933	1,089	1,244	1,400	1,400	1,400
Valley Oak Woodland	-	189	378	567	756	944	1,133	1,322	1,511	1,700	1,700	1,700
Mixed Oak Woodland and Forest	-	789	1,578	2,367	3,156	3,944	4,733	5,522	6,311	7,100	7,100	7,100
Blue Oak Woodland	-	122	244	367	489	611	733	856	978	1,100	1,100	1,100
Coast Live Oak Forest and Woodland	-	322	644	967	1,289	1,611	1,933	2,256	2,578	2,900	2,900	2,900
Foothill Pine - Oak Woodland	-	9	18	27	36	44	53	62	71	80	80	80
Mixed Evergreen Forest	-	2	4	7	9	11	13	16	18	20	20	20
Willow Riparian Forest and Scrub and Mixed Riparian Forest and Woodland	-	102	204	306	408	509	611	713	815	917	917	917
Central California Sycamore Alluvial Woodland	-	6	12	18	24	30	36	42	48	54	54	54
Redwood Forest	-	1	2	3	4	6	7	8	9	10	10	10
Ponderosa Pine Woodland	-	0	0	0	0	0	0	0	0	0	0	0
Knobcone Pine Woodland	-	0	0	0	0	0	0	0	0	0	0	0
Coastal and Valley Freshwater Marsh	-	11	21	32	42	53	63	74	84	95	95	95
Seasonal Wetland	-	7	13	20	27	33	40	47	53	60	60	60
Pond	-	20	39	59	79	98	118	138	157	177	177	177
<b>Total acres</b>	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153	34,153
<b>Total stream miles (overlay)</b>	-	12	25	37	49	61	74	86	98	110	110	110

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-0e: Habitat Acquired for Reserve System by Species** (Source: Table 5-17 for wildlife and Table 5-16 for covered plants)

**Final Plan**

Species	Unit	Habitat Monitored	
California Red-Legged Frog	acres	1,300	Primary (Breeding)
California Red-Legged Frog (streams)	miles	n/a	Primary (Breeding)
California Tiger Salamander	acres	150	Breeding
California Tiger Salamander (streams)	miles	n/a	Primary (Breeding)
Pond Turtle	acres	7,000	Primary (Breeding)
Pond Turtle (streams)	miles	n/a	Primary (Breeding)
Foothill Yellow-Legged Frog (streams)	miles	30	Primary (Breeding)
San Joaquin Kit Fox	acres	4,000	Secondary habitat (dispersal)
Western Burrowing Owl (overwintering)	acres	-	Overwintering
Western Burrowing Owl (breeding)	acres	-	Breeding
Townsend's Bat	acres	n/a	Roosting
Least Bell's Vireo	acres	600	Primary (Breeding)
Tricolored Blackbird	acres	1,000	Primary (Breeding)
Golden Eagle	acres	n/a	Primary (Breeding)
Bay checkerspot butterfly	acres	3,800	Primary (Breeding)
Covered Plants	occurrence	159	Primary (Breeding)

Assumptions / Notes:

Although the commitment to Least Bell's Vireo (LBV) protection is only 460 acres (per Table 5-17), the monitoring cost estimate is conservatively based on 600 acres of LBV habitat that may be protected

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-1: Program Administration  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total
Capital Budget												
Office furniture & equipment by employee	\$19,292	\$30,093	\$21,341	\$22,027	\$22,437	\$42,979	\$22,225	\$22,415	\$22,225	\$42,979	\$22,225	\$290,239
General office equipment	\$0	\$7,939	\$5,289	\$6,911	\$5,289	\$7,939	\$4,261	\$7,939	\$5,289	\$6,911	\$5,289	\$63,059
Technology equipment	\$0	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440	\$310,050
Vehicle purchase	\$0	\$2,162	\$0	\$4,325	\$0	\$4,325	\$0	\$4,325	\$0	\$4,325	\$0	\$19,462
Capital Subtotal	\$19,292	\$76,765	\$52,071	\$69,833	\$53,166	\$91,814	\$51,926	\$71,250	\$52,954	\$90,785	\$52,954	\$682,810
Operational Budget												
Employees	\$232,538	\$1,971,203	\$2,040,964	\$2,087,471	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$21,270,026
Office space lease and utilities	\$50,880	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$2,594,880
Office equipment maintenance & supplies	\$1,844	\$53,133	\$54,422	\$55,067	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712	\$554,449
Maintenance of general office equipment	\$0	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$1,621,800
Maintenance of technology equipment	\$0	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$44,520
GIS services (contract)	\$0	\$159,000	\$159,000	\$159,000	\$159,000	\$159,000	\$106,000	\$106,000	\$106,000	\$106,000	\$106,000	\$1,325,000
Vehicle fuel and maintenance	\$0	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$14,190
Travel	\$2,783	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$144,226
Vehicle / mileage allowance	\$129	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$22,620
Insurance	\$20,405	\$140,980	\$140,980	\$150,255	\$150,255	\$150,255	\$150,255	\$150,255	\$140,980	\$140,980	\$140,980	\$1,476,580
Staff training and uniforms	\$477	\$11,130	\$13,515	\$15,105	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695	\$157,092
Legal assistance	\$0	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$3,710,000
Financial analysis assistance	\$0	\$37,100	\$74,200	\$74,200	\$74,200	\$74,200	\$74,200	\$74,200	\$74,200	\$74,200	\$74,200	\$593,600
JPA member meeting stipend	\$0	\$50,880	\$50,880	\$50,880	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440	\$330,720
Law enforcement / Public Safety	\$0	\$160,899	\$321,797	\$482,696	\$643,594	\$804,493	\$965,391	\$1,126,290	\$1,287,189	\$1,448,087	\$1,448,087	\$8,688,523
Public education and outreach	\$0	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$2,650,000
Operational Subtotal	\$309,055	\$3,659,168	\$3,930,603	\$4,149,519	\$4,296,619	\$4,494,618	\$4,602,517	\$4,726,315	\$4,915,039	\$5,075,937	\$5,038,837	\$45,198,227
Total	\$328,347	\$3,735,933	\$3,982,673	\$4,219,351	\$4,349,786	\$4,586,432	\$4,654,442	\$4,797,565	\$4,967,993	\$5,166,723	\$5,091,791	\$45,881,037

**Table G-1a: Employee Costs (including shared staff costs)**

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per FTE per year	Number of FTEs per year per period										
				0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Administrative Director	\$127,200	35%	\$171,720	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
IT - Database / GIS Management	\$76,320	35%	\$103,032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Budget Analyst	\$74,200	35%	\$100,170	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Grant Specialist	\$90,100	35%	\$121,635	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Public Education & Outreach	\$63,600	35%	\$85,860	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Administrative Assistant	\$53,000	35%	\$71,550	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total FTEs				1.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Employee cost per year				\$232,538	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328	\$361,328
Employee cost per period				\$232,538	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638	\$1,806,638
Shared staff cost per period				\$0	\$164,565	\$234,326	\$280,834	\$327,341	\$327,341	\$327,341	\$327,341	\$327,341	\$327,341	\$327,341
Employee cost per period				\$232,538	\$1,971,203	\$2,040,964	\$2,087,471	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979	\$2,133,979

Assumptions / Notes:

The position of senior scientist is included in shared staff and overhead.

JPA employee costs are not included in the program administration cost category.

Admin - Secretary time is allocated 50% to program administration and 50% to reserve management.

10% Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

**Table G-1b: Office Space**

Cost per square foot per month, including utilities	Total space leased per period (square feet)										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
\$2.12	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Lease cost per year	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880	\$50,880
Lease cost per period	\$50,880	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400	\$254,400

Assumptions / Notes:

Assumes Implementing Entity will lease office space.

**Table G-1c: Utility Costs (for office space)**

Table 6: Per Utility Costs (Per Office Space)											
Annual cost per square foot of office space	Utility cost per period										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Utility cost per year	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Utility cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

Utility costs included in office lease costs, above.

\$0.00 Annual cost per sq. ft. of office space

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-1: Program Administration  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-1d: Office Equipment and Supplies by Employee (including shared costs)**

Equipment type	Cost per FTE per replacement period	Cost of service contract per year	Number of FTEs with office equipment and supply costs (per year per period)										
			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total FTEs			1.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Common office furniture	\$2,120		4	3	-	-	-	6	-	-	-	6	-
Cubicle furniture	\$2,120		2	2	-	-	-	3	-	-	-	3	-
Office supplies (annual)	\$530		2	15	15	15	15	15	15	15	15	15	15
Computers	\$2,650	\$265	2	5	5	5	5	5	5	5	5	5	5
Cell phones	\$636	\$127	2	8	8	8	8	8	8	8	8	8	8
Furniture and equipment (capital) cost per period			\$19,292	\$27,560	\$18,020	\$18,020	\$18,020	\$37,100	\$18,020	\$18,020	\$18,020	\$37,100	\$18,020
Shared furniture and equipment cost per period			\$0	\$2,533	\$3,321	\$4,007	\$4,417	\$5,879	\$4,205	\$4,395	\$4,205	\$5,879	\$4,205
Total furniture and equipment (capital) cost per period			\$19,292	\$30,093	\$21,341	\$22,027	\$22,437	\$42,979	\$22,225	\$22,415	\$22,225	\$42,979	\$22,225
Maintenance and supplies cost per year			\$1,844	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229	\$10,229
Maintenance and supplies cost per period			\$1,844	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145	\$51,145
Shared maintenance and supplies cost per period			\$0	\$1,988	\$3,277	\$3,922	\$4,567	\$4,567	\$4,567	\$4,567	\$4,567	\$4,567	\$4,567
Total maintenance and supplies cost per period			\$1,844	\$53,133	\$54,422	\$55,067	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712	\$55,712

Assumptions / Notes:

- 2 unit of common office furniture purchased every 20 years
- 20 year replacement period for common office furniture
- 20 year replacement period for cubicle office furniture (per employee)
- 1 year replacement period for office supplies
- 3 year replacement period for computers
- 2 year replacement period for cell phones
- 10% Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

**Table G-1e: General Office Equipment**

	Cost per year (leased items) / cost per item (purchased items)	Cost of service contract per item per year	Number of items leased, purchased, or retired, per period											
			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Color printer/copy machine/scanner (lease)	\$11,660	\$0	-	1	1	1	1	1	1	1	1	1	1	
Office telephone systems (lease)	\$6,360	\$0	-	1	1	1	1	1	1	1	1	1	1	
Books and journals (purchase)	\$1,590		-	5	5	5	5	5	5	5	5	5	5	
New fax machines purchased	\$265		-	1	1	1	1	1	1	1	1	1	1	
Old fax machines retired			-	-	1	1	1	1	1	1	1	1	1	
Total fax machines		\$0	-	1	1	1	1	1	1	1	1	1	1	
New printers purchased	\$1,484		-	2	2	2	2	2	2	2	2	2	2	
Old printers retired			-	1	1	2	2	2	2	2	2	2	2	
Total printers		\$0	-	1	2	2	2	2	2	2	2	2	2	
New digital cameras purchased	\$514		-	4	4	4	4	4	4	4	4	4	4	
Old digital cameras retired			-	2	4	2	4	2	4	4	4	2	4	
Total digital cameras		\$0	-	2	2	2	2	2	2	2	2	2	2	
Radio base station purchased	\$2,650		-	1	-	1	-	1	-	1	-	1	-	
Radio base station retired			-	-	-	1	-	1	-	1	-	1	-	
Total radio base stations		\$106	-	1	1	1	1	1	1	1	1	1	1	
Trunked radio system (shared tower and repeaters)	\$6,360		-	1	1	1	1	1	1	1	1	1	1	
Equipment purchase (capital) cost per period			\$0	\$7,939	\$5,289	\$6,911	\$5,289	\$7,939	\$4,261	\$7,939	\$5,289	\$6,911	\$5,289	
Lease and maintenance (operating) cost per year			\$0	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	\$32,436	
Lease and maintenance cost per period			\$0	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	\$162,180	

Assumptions / Notes:

- Assumes printer and phone maintenance/service contracts provided at no cost by Permittees.
- 5 year replacement period for fax machine and printer.
- 3 year replacement period for digital cameras.
- 10 year replacement period for radio base station.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-1: Program Administration  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-1f: Technology Equipment/Services**

	Cost per item	Cost of software update or service contract per 5-year period	Number of items leased, purchased, or retired, per period										
			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
New GIS/database servers purchased	\$10,600		-	-	-	-	-	-	-	-	-	-	-
Old GIS/database servers retired			-	-	-	-	-	-	-	-	-	-	-
Total GIS/database servers		\$1,060	-	-	-	-	-	-	-	-	-	-	-
New tablet PC purchased	\$5,300		-	2	2	2	2	2	2	2	2	2	2
Old tablet PCs retired			-	-	2	2	2	2	2	2	2	2	2
Total tablet PCs		\$530	-	2	2	2	2	2	2	2	2	2	2
New plotters purchased	\$11,130		-	1	-	1	1	-	1	-	1	-	1
Old plotters retired			-	-	-	1	-	1	-	1	-	1	-
Total plotters		\$424	-	1	1	1	1	1	1	1	1	1	1
New GPS units purchased	\$4,240		-	2	2	2	2	2	2	2	2	2	2
Old GPS units retired			-	-	2	2	2	2	2	2	2	2	2
Total GPS units		\$742	-	2	2	2	2	2	2	2	2	2	2
New GIS software purchased	\$7,420		-	-	-	-	-	-	-	-	-	-	-
Old GIS software retired			-	-	-	-	-	-	-	-	-	-	-
Total GIS software		\$1,590	-	-	-	-	-	-	-	-	-	-	-
New computer software purchased	\$3,180		-	2	2	2	2	2	2	2	2	2	2
Old computer software retired			-	-	2	2	2	2	2	2	2	2	2
Total computer software		\$742	-	2	2	2	2	2	2	2	2	2	2
Equipment purchase (capital) cost per period			\$0	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440	\$36,570	\$25,440
Maintenance cost per period			\$0	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452	\$4,452
GIS contract services per period			\$0	\$159,000	\$159,000	\$159,000	\$159,000	\$159,000	\$106,000	\$106,000	\$106,000	\$106,000	\$106,000

Assumptions / Notes:

\$31,800	annual cost of contract GIS services, years 1 - 25
\$21,200	annual cost of contract GIS services, years 26 - 50
5	year replacement period for GIS and database equipment purchased.
3	year software upgrade cycle

GIS services contracted with local partners or other entities.

**Table G-1g: Passenger Vehicles and Fuel (shared with restoration, reserve management, and monitoring)**

Cost per 5-year period	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger car purchase	\$0	\$2,162	\$0	\$4,325	\$0	\$4,325	\$0	\$4,325	\$0	\$4,325	\$0
Vehicle fuel and maintenance	\$0	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419	\$1,419

Assumptions / Notes:

10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration
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**Table G-1h: Vehicle Mileage Allowance (including shared cost)**

		Vehicle Mileage Allowance by Employee											
	Mileage allowance per year per FTE (miles)	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Administrative Director	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
IT - Database / GIS Management	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Budget Analyst	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Grant Specialist	500	\$129	\$129	\$129	\$129	\$129	\$129	\$129	\$129	\$129	\$129	\$129	
Public Education & Outreach	1,000	\$0	\$257	\$257	\$257	\$257	\$257	\$257	\$257	\$257	\$257	\$257	
Administrative Assistant	250	\$0	\$64	\$64	\$64	\$64	\$64	\$64	\$64	\$64	\$64	\$64	
Mileage allowance cost per year		\$129	\$450	\$450	\$450	\$450	\$450	\$450	\$450	\$450	\$450	\$450	
Mileage allowance cost per period		\$129	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	
Shared mileage allowance cost per period		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Mileage allowance cost per period		\$129	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	\$2,249	

Assumptions / Notes:

\$0.514	Cost per mile for travel allowance
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

Assumes Administrative Director uses implementing entity-owned passenger car and field staff use owned trucks, see G-2c and G-5f



# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-1: Program Administration**

**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-1i: Overnight Travel (including shared cost)**

	Days of overnight travel per FTE per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Administrative Director	5	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783
IT - Database / GIS Management	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Budget Analyst	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Grant Specialist	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Public Education & Outreach	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Administrative Assistant	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Travel cost per year		\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783	\$2,783
Travel cost per period		\$2,783	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913	\$13,913
Shared travel cost per period		\$0	\$232	\$232	\$232	\$232	\$232	\$232	\$232	\$232	\$232	\$232
Travel cost per period		\$2,783	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144	\$14,144

Assumptions / Notes:

\$186	Travel allowance per diem
3.00	Per diem multiplier for executive director to cover additional travel expenses such as airfare
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

**Table G-1j: Insurance**

Insurance type	Cost per year per vehicle	Cost per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total vehicles per year			-	4	4	5	5	5	5	5	4	4	4
Automobile	\$1,855	\$5,830	\$0	\$7,791	\$7,791	\$9,646	\$9,646	\$9,646	\$9,646	\$9,646	\$7,791	\$7,791	\$7,791
Directors and officers		\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830
Liability		\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830	\$5,830
Professional liability		\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745	\$8,745
Insurance cost per year			\$20,405	\$28,196	\$28,196	\$30,051	\$30,051	\$30,051	\$30,051	\$30,051	\$28,196	\$28,196	\$28,196
Insurance cost per period			\$20,405	\$140,980	\$140,980	\$150,255	\$150,255	\$150,255	\$150,255	\$150,255	\$140,980	\$140,980	\$140,980

**Table G-1k: Staff Training**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total Staff	1.5	7.0	8.5	9.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Staff training cost per year	\$477	\$2,226	\$2,703	\$3,021	\$3,339	\$3,339	\$3,339	\$3,339	\$3,339	\$3,339	\$3,339
Staff training cost per period	\$477	\$11,130	\$13,515	\$15,105	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695	\$16,695

Assumptions / Notes:

\$318	Annual cost of training per staff member (excluding travel)
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**Table G-1l: Staff Uniforms**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total Staff	1.5	7.0	8.5	9.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Uniform annual cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Uniform cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

\$0	Annual cost for t-shirts and polos for all employees
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**Table G-1m: Legal Assistance**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Hours per period	-	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Legal assistance cost per period	\$0	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000	\$371,000

Assumptions / Notes:

\$371	Hourly rate for legal assistance
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Assumes outside legal counsel or cost of in-house counsel shared from a partner agency, particularly after start-up period.

The legal assistance category covers legal assistance required under the program administration and land acquisition cost categories.

**Table G-1n: Financial Analysis Assistance**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per 5-year period	\$0	\$37,100	\$74,200	\$74,200	\$37,100	\$74,200	\$74,200	\$37,100	\$74,200	\$74,200	\$37,100
Financial analysis cost per period	\$0	\$37,100	\$74,200	\$74,200	\$37,100	\$74,200	\$74,200	\$37,100	\$74,200	\$74,200	\$37,100

Assumptions / Notes:

The financial analysis assistance category covers the periodic assistance of a financial analyst to review the program's cost/revenue balance and ensure that charges are adjusted in line with changing land costs.

After start-up, financial analyst review will occur once every 3 years (years 3,6,9,12,15,18,21,24,27,30,33,36,39,42,45, and 48).

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-1: Program Administration**

**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-1o: JPA Member Meeting Stipend**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Number of meetings per period	-	20	20	20	10	10	10	10	10	10	10
Total stipend per period	\$0	\$50,880	\$50,880	\$50,880	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440	\$25,440

Assumptions / Notes:

8	Number of JPA members
\$318	Stipend per meeting per member

**Table G-1p: Law Enforcement /Public Safety Costs**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres managed (cumulative total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Annual law enforcement cost	\$0	\$32,180	\$64,359	\$96,539	\$128,719	\$160,899	\$193,078	\$225,258	\$257,438	\$289,617	\$289,617
Cost per period	\$0	\$160,899	\$321,797	\$482,696	\$643,594	\$804,493	\$965,391	\$1,126,290	\$1,287,189	\$1,448,087	\$1,448,087

Assumptions / Notes:

\$8.48	Law enforcement cost per reserve acre per year
Law enforcement and public safety costs on existing open space will be covered by County Parks through County Parks Rangers and the County Sheriff.	

**Table G-1q: Public Education/Outreach**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Public education cost per year	\$0	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000	\$53,000
Public education cost per period	\$0	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000	\$265,000

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-2: Shared staff and overhead (shared among management, restoration, and monitoring)**  
**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
<b>Capital budget</b>												
Office furniture & equipment	\$0	\$25,334	\$33,213	\$40,068	\$44,167	\$58,795	\$42,047	\$43,955	\$42,047	\$58,795	\$42,047	\$430,466
Passenger car purchase	\$0	\$21,624	\$0	\$43,248	\$0	\$43,248	\$0	\$43,248	\$0	\$43,248	\$0	\$194,616
<b>Capital subtotal</b>	<b>\$0</b>	<b>\$46,958</b>	<b>\$33,213</b>	<b>\$83,316</b>	<b>\$44,167</b>	<b>\$102,043</b>	<b>\$42,047</b>	<b>\$87,203</b>	<b>\$42,047</b>	<b>\$102,043</b>	<b>\$42,047</b>	<b>\$625,082</b>
<b>Operational budget</b>												
Staff	\$0	\$1,645,650	\$2,343,263	\$2,808,338	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$29,711,138
Equipment maintenance & supplies	\$0	\$19,875	\$32,772	\$39,220	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668	\$411,545
Vehicle fuel and maintenance	\$0	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$141,900
Vehicle mileage allowance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Overnight travel	\$0	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$23,188
<b>Operational subtotal</b>	<b>\$0</b>	<b>\$1,682,034</b>	<b>\$2,392,543</b>	<b>\$2,864,066</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$3,335,590</b>	<b>\$30,287,770</b>
<b>Total</b>	<b>\$0</b>	<b>\$1,728,992</b>	<b>\$2,425,756</b>	<b>\$2,947,382</b>	<b>\$3,379,756</b>	<b>\$3,437,632</b>	<b>\$3,377,636</b>	<b>\$3,422,792</b>	<b>\$3,377,636</b>	<b>\$3,437,632</b>	<b>\$3,377,636</b>	<b>\$30,912,852</b>

**Table G-2a: Staff (shared among administration, reserve management, restoration and monitoring)**

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per employee per year	Number of FTEs per year per period										
				0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Senior Scientist	\$100,700	35%	\$135,945	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Project Manager/Conservation Planner	\$90,100	35%	\$121,635	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Field Staff	\$68,900	35%	\$93,015	0.0	1.5	3.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total FTEs				0.0	3.0	4.5	5.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Employee cost per year				\$0	\$329,130	\$468,653	\$561,668	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683
Employee cost per period				\$0	\$1,645,650	\$2,343,263	\$2,808,338	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413	\$3,273,413

**Table G-2b: Office Equipment and Supplies (shared among administration, reserve management, restoration and monitoring)**

	Cost per employee per year	Cost of service contract per year	Number of employees / vehicles with equipment										
Equipment type			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
		Total FTEs	-	3	5	6	7	7	7	7	7	7	7
Cubicle furniture	\$2,120		-	3	2	1	1	7	-	-	-	7	-
Office supplies (annual)	\$530		-	3	5	6	7	7	7	7	7	7	7
Computers	\$2,650	\$265	-	5	8	10	12	12	12	12	12	12	12
Cell phones	\$636	\$127	-	8	13	15	18	18	18	18	18	18	18
Mobile radios purchased	\$954		-	1	-	2	-	2	-	2	-	2	-
Total Mobile radios		\$106	-	1	1	1	1	1	1	1	1	1	1
Furniture and equipment (capital) cost per period			\$0	\$25,334	\$33,213	\$40,068	\$44,167	\$58,795	\$42,047	\$43,955	\$42,047	\$58,795	\$42,047
Maintenance and supplies cost per year			\$0	\$3,975	\$6,554	\$7,844	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134
Maintenance and supplies cost per period			\$0	\$19,875	\$32,772	\$39,220	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668	\$45,668

Assumptions / Notes:

20	year replacement period for cubicle office furniture (per employee)
1	year replacement period for office supplies
3	year replacement period for computers
2	year replacement period for cell phones
1	Mobile radio per vehicle

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-2: Shared staff and overhead (shared among management, restoration, and monitoring)**  
**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-2c: Passenger Vehicles and Fuel (shared among administration, reserve management, restoration, and monitoring)**

	Number of vehicles										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
New passenger cars purchased, per period	-	1	-	2	-	2	-	2	-	2	-
Old passenger cars retired, per period	-	-	-	2	-	2	-	2	-	2	-
Total passenger cars, per year, per period	-	1	1	1	1	1	1	1	1	1	1
Passenger car purchase cost per period	\$0	\$21,624	\$0	\$43,248	\$0	\$43,248	\$0	\$43,248	\$0	\$43,248	\$0
Fuel and maintenance per year	\$0	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838
Fuel and maintenance per period	\$0	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190	\$14,190

Assumptions / Notes:

\$21,624	Passenger car purchase price
\$1,590	Fuel cost per vehicle per year
\$1,248	Maintenance cost per vehicle per year

**Table G-2d: Vehicle Mileage Allowance (shared among administration, reserve management, restoration, and monitoring)**

		Vehicle Mileage Allowance by Employee										
	Mileage allowance per year per FTE (miles)	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Senior Scientist	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Project Manager/Conservation Planner	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Field Staff	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Mileage allowance cost per year		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Mileage allowance cost per period		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

\$0.514	Cost per mile for travel allowance
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Assumes Administrative Director uses implementing entity-owned passenger car and field staff use owned trucks, see G-2c and G-5f

**Table G-2e: Overnight Travel (shared among administration, reserve management, restoration and monitoring)**

	Days of overnight travel per FTE per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Senior Scientist	3	\$0	\$278	\$278	\$278	\$278	\$278	\$278	\$278	\$278	\$278	\$278
Project Manager/Conservation Planner	1	\$0	\$186	\$186	\$186	\$186	\$186	\$186	\$186	\$186	\$186	\$186
Field Staff	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Travel cost per year		\$0	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464
Travel cost per period		\$0	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319	\$2,319

Assumptions / Notes:

\$186	Travel allowance per diem
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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-3: Land Acquisition  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Capital Budget (before contingency)												
Acquisition	\$3,600,000	\$25,050,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$0	\$257,853,000
Site improvements	\$0	\$1,266,414	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$905,166	\$0	\$10,776,776
<b>Capital Subtotal</b>	<b>\$3,600,000</b>	<b>\$26,316,747</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,879,647</b>	<b>\$29,555,499</b>	<b>\$0</b>	<b>\$268,629,776</b>
Operational Budget												
Due diligence	\$60,553	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$0	\$5,237,791
Pre-acquisition surveys	\$69,905	\$490,875	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$0	\$5,047,026
<b>Operational Subtotal</b>	<b>\$130,458</b>	<b>\$1,066,124</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$1,136,029</b>	<b>\$0</b>	<b>\$10,284,817</b>
<b>Total (before contingency)</b>	<b>\$3,730,458</b>	<b>\$27,382,871</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$31,015,677</b>	<b>\$30,691,529</b>	<b>\$0</b>	<b>\$278,914,593</b>

**Table G-3a: Land Acquisition Cost over 50-year Program**

	Cost per 5-year period											
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Location												
Acres acquired by period	500.00	3,511.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	-	
Near East Hills	\$1,800,000	\$6,045,000	\$7,845,000	\$7,845,000	\$7,845,000	\$7,845,000	\$7,845,000	\$7,845,000	\$7,845,000	\$7,845,000	-	
Near West Hills	\$0	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	\$3,612,000	-	
Remote East Hills	\$0	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	\$7,592,000	-	
Remote West Hills	\$1,800,000	\$4,558,000	\$6,358,000	\$6,358,000	\$6,358,000	\$6,358,000	\$6,358,000	\$6,358,000	\$6,358,000	\$6,358,000	-	
Almaden Valley/Valley Floor	\$0	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	\$3,243,333	-	
Total before contingency	\$3,600,000	\$25,050,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$28,650,333	\$0	
Total with contingency	\$3,708,000	\$25,801,843	\$29,509,843	\$29,509,843	\$29,509,843	\$29,509,843	\$29,509,843	\$29,509,843	\$29,509,843	\$29,509,843	\$0	

Assumptions / Notes:

Easements assumed for agricultural land and ranchland per the assumptions below.

300	Number of acres acquired in Remote West Hills during plan development (one transaction, fee title).
200	Number of acres acquired in Near East Hills during plan development (one transaction).
11.1%	Percent of each land cover type acquired in each 5-year period beginning in year 1, assuming acquisition complete by year 45, and acres acquired during plan development deducted from first period.
0%	Percent of Valley Floor that is agricultural land in the Pajaro River Valley that will be acquired using conservation easements
50%	Percent of Remote and Near Hills that is ranchland that will be acquired using conservation easements.
80%	Percent of fee title cost required for easement acquisition
3%	Contingency factor for land acquisition and site improvements

**Table G-3b: Proposed Land Acquisition Cost Assumptions, by location and parcel size (fee title purchase price per acre in 2007 dollars)**

Location	Less than 50 acres		
	50 - 250 acres	Over 250 acres	
Near East Hills	\$28,000	\$9,000	\$8,000
Near West Hills	\$28,000	\$9,000	\$8,000
Remote East Hills	\$10,000	\$9,000	\$6,000
Remote West Hills	\$10,000	\$9,000	\$6,000
Almaden Valley / Valley Floor	\$34,000	\$17,000	\$16,000

For cost estimating purposes, land costs assumed to remain constant (in real terms) over time. See Chapter 9 for automatic and periodic inflation factors that are built into the fees to account for expected increases in land cost over time.

**Table G-3c: Due Diligence**

	Cost per acquisition	Cost per 5-year period										
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Number of acquisitions		2	19	19	19	19	19	19	19	19	19	-
Appraisals	\$5,300	\$13,250	\$125,875	\$125,875	\$125,875	\$125,875	\$125,875	\$125,875	\$125,875	\$125,875	\$125,875	\$0
Preliminary title report	\$530	\$1,325	\$12,588	\$12,588	\$12,588	\$12,588	\$12,588	\$12,588	\$12,588	\$12,588	\$12,588	\$0
Phase I site assessment	\$3,445	\$8,613	\$81,819	\$81,819	\$81,819	\$81,819	\$81,819	\$81,819	\$81,819	\$81,819	\$81,819	\$0
Legal description	\$4,346	\$10,865	\$103,218	\$103,218	\$103,218	\$103,218	\$103,218	\$103,218	\$103,218	\$103,218	\$103,218	\$0
Boundary survey	\$5,963	\$14,906	\$141,609	\$141,609	\$141,609	\$141,609	\$141,609	\$141,609	\$141,609	\$141,609	\$141,609	\$0
Monumentation	\$4,638	\$11,594	\$110,141	\$110,141	\$110,141	\$110,141	\$110,141	\$110,141	\$110,141	\$110,141	\$110,141	\$0
Total	\$24,221	\$60,553	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$575,249	\$0

Assumptions / Notes:

170	Number of acquisitions over plan term, including acquisitions during plan development (below)
2	Number of acquisitions during plan development.
1.25	Due diligence premium for land not acquired but surveyed/processed for potential acquisition. Applies to number of acquisitions and amount of land surveyed.
12,500	Average acquisition parcel boundary length in feet
\$0.48	Cost per linear foot for boundary survey
\$0.37	Cost per linear foot for monumentation

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-3: Land Acquisition  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-3d: Pre-acquisition Surveys - contractor hours**

	Hours per 100 acres	Cost per 5-year period										
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres acquired per period		500.00	3,511.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	4,011.00	-
Land cover type surveys	12.0	\$9,533	\$66,938	\$76,470	\$76,470	\$76,470	\$76,470	\$76,470	\$76,470	\$76,470	\$76,470	\$0
Covered species habitat surveys	16.00	\$12,710	\$89,250	\$101,960	\$101,960	\$101,960	\$101,960	\$101,960	\$101,960	\$101,960	\$101,960	\$0
Covered plant surveys	32.0	\$25,420	\$178,500	\$203,920	\$203,920	\$203,920	\$203,920	\$203,920	\$203,920	\$203,920	\$203,920	\$0
Covered wildlife surveys	28.00	\$22,243	\$156,188	\$178,430	\$178,430	\$178,430	\$178,430	\$178,430	\$178,430	\$178,430	\$178,430	\$0
Total		\$69,905	\$490,875	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$560,781	\$0

**Assumptions / Notes:**

1.25	Premium for land not acquired but surveyed/processed for potential acquisition. Applies to amount of land surveyed.
100	Acres average/minimum parcel size for pre-acquisition surveys

Land cover type surveys include surveys for federal and state jurisdictional waters, and submitting of a report to the USACE and obtaining a verification (includes some hours to respond to any changes the Corps may require). Land cover type and wetland delineation surveys will occur concurrently.

Covered plant surveys include three visits during the blooming season to cover different blooming times.

Hours include field work and report writing.

\$127	Contractor cost per hour including amortized per diem and travel
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**Table G-3e: Site Improvements**

		Cost per 5-year period										
	Cost per unit	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Number of acquisitions for site improvements		-	21	19	19	19	19	19	19	19	19	-
Reserve acres acquired for site improvements		-	4,011	4,011	4,011	4,011	4,011	4,011	4,011	4,011	4,011	-
Demolition of old facilities per 500 acres	\$5,300	\$0	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$0
Repair and replacement of gates per 100 acres	\$4,240	\$0	\$170,066	\$170,066	\$170,066	\$170,066	\$170,066	\$170,066	\$170,066	\$170,066	\$170,066	\$0
Signs (boundary, landbank, etc.) per 100 acres	\$2,650	\$0	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$0
Other security (e.g., boarding up barns) per 100 acres	\$2,120	\$0	\$85,033	\$85,033	\$85,033	\$85,033	\$85,033	\$85,033	\$85,033	\$85,033	\$85,033	\$0
New fence installation per 5-year period	\$324,148	\$0	\$324,148	\$324,148	\$324,148	\$324,148	\$324,148	\$324,148	\$324,148	\$324,148	\$0	\$0
Repair/removal of boundary fence per acquisition	\$18,550	\$0	\$389,550	\$352,450	\$352,450	\$352,450	\$352,450	\$352,450	\$352,450	\$352,450	\$352,450	\$0
Road obliteration at acquisition per 1,000 acres	\$26,500	\$0	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$106,292	\$0
Road stabilization at acquisition per 1,000 acres	\$10,600	\$0	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$42,517	\$0
Total before contingency		\$0	\$1,266,414	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$1,229,314	\$905,166	\$0
Total with contingency		\$0	\$1,304,406	\$1,266,193	\$1,266,193	\$1,266,193	\$1,266,193	\$1,266,193	\$1,266,193	\$1,266,193	\$932,321	\$0

**Assumptions / Notes:**

Site improvements for land acquired during plan development assumed to occur during years 1 -5 of plan implementation.

Road and fencing improvements will facilitate grazing operations for ongoing landscape management.

\$11.66	Average cost of new fence installation by linear foot, once land is acquired
\$4.24	Average cost per linear foot for boundary fence repair or removal upon acquisition
27,800	Average linear feet of new fencing installed upon acquisition per 5-year time period; function of acquisitions over time
12,500	Average linear feet of existing fencing per acquisition
35%	Proportion of existing boundary fence that needs repair or removal at acquisition
\$106,000	Average cost per mile for road obliteration upon acquisition (re-contouring to natural contours, compaction, erosion control, seeding with natives and weed control)
0.3	Average miles of road obliterated upon acquisition per 1,000 acres acquired
\$21,200	Average cost per mile for road stabilization and abandonment upon acquisition (erosion control measures, removal of stream crossing reastures, ripping roadbed, etc.)
0.5	Average miles of road stabilization and abandonment upon acquisition per 1,000 acres acquired
3%	Contingency factor for land acquisition and site improvements

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-4: Habitat Restoration/Creation  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

Capital budget	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Creation/Restoration (including contingency)	\$0	\$9,384,682	\$9,384,682	\$9,384,682	\$9,384,682	\$9,384,682	\$9,384,682	\$9,384,682	\$9,384,682	\$0	\$0	\$75,077,454
Furniture and equipment purchase	\$0	\$8,867	\$11,625	\$14,024	\$15,458	\$20,578	\$14,716	\$15,384	\$14,716	\$20,578	\$14,716	\$150,663
Vehicle purchase	\$0	\$7,568	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0	\$68,116
Remedial measures for long term mngmt.	\$0	\$2,280	\$4,559	\$6,839	\$9,118	\$11,398	\$13,677	\$15,957	\$18,237	\$18,237	\$18,237	\$118,538
<b>Capital Subtotal</b>	<b>\$0</b>	<b>\$9,403,397</b>	<b>\$9,400,866</b>	<b>\$9,420,681</b>	<b>\$9,409,258</b>	<b>\$9,431,795</b>	<b>\$9,413,076</b>	<b>\$9,431,160</b>	<b>\$9,417,635</b>	<b>\$53,952</b>	<b>\$32,953</b>	<b>\$75,414,770</b>
<b>Operational budget</b>												
Environmental compliance	\$0	\$339,730	\$339,730	\$339,730	\$339,730	\$339,730	\$339,730	\$339,730	\$129,850	\$0	\$0	\$2,507,960
Staff	\$0	\$575,978	\$820,142	\$982,918	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$10,398,898
Equipment maintenance and supplies	\$0	\$6,956	\$11,470	\$13,727	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$144,041
Vehicle fuel and maintenance	\$0	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$49,665
Vehicle mileage allowance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Overnight travel	\$0	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$8,116
Long-term management operations	\$0	\$22,796	\$45,592	\$68,387	\$91,183	\$113,979	\$136,775	\$159,571	\$182,366	\$182,366	\$182,366	\$1,185,381
Biological monitoring contractors	\$0	\$64,018	\$128,037	\$167,004	\$222,672	\$278,340	\$334,009	\$389,677	\$445,345	\$445,345	\$445,345	\$2,919,791
<b>Operational Subtotal</b>	<b>\$0</b>	<b>\$1,015,256</b>	<b>\$1,350,748</b>	<b>\$1,577,545</b>	<b>\$1,821,042</b>	<b>\$1,899,506</b>	<b>\$1,977,970</b>	<b>\$2,056,434</b>	<b>\$1,925,017</b>	<b>\$1,795,167</b>	<b>\$1,795,167</b>	<b>\$17,213,852</b>
<b>Total</b>	<b>\$0</b>	<b>\$10,418,652</b>	<b>\$10,751,614</b>	<b>\$10,998,226</b>	<b>\$11,230,300</b>	<b>\$11,331,300</b>	<b>\$11,391,045</b>	<b>\$11,487,593</b>	<b>\$11,342,652</b>	<b>\$1,849,119</b>	<b>\$1,828,120</b>	<b>\$92,628,622</b>

**Table G-4a: Land Cover Type Restored/Created**

Land Cover Type (acres)	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Willow Riparian Forest & Scrub, Mixed Riparian Forest & Scrub	0.0	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	0.0	0.0	339.0
Central California Sycamore Alluvial Woodland	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	14.0
Coastal and Valley Freshwater Marsh	0.0	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	0.0	0.0	45.0
Seasonal Wetland	0.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	0.0	0.0	30.0
Ponds	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	72.0
Subtotal (acres)	0.0	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	0.0	0.0	500.0
Streams (miles)	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0	10.4
<b>Total (acres)</b>	<b>0.0</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>63.3</b>	<b>0.0</b>	<b>0.0</b>	<b>506.3</b>

**Table G-4b: Cost of Restoration/Creation Construction (refer to Table G-0a Assumptions / Notes for detailed cost factors by land cover type)**

Land Cover Type	Unit	Cost per unit (before contingency)	Implementation Period (Years)										
			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Willow Riparian Forest & Scrub, Mixed Riparian Forest & Scrub	acres	\$75,862	\$0	\$3,214,652	\$3,214,652	\$3,214,652	\$3,214,652	\$3,214,652	\$3,214,652	\$3,214,652	\$3,214,652	\$0	\$0
Central California Sycamore Alluvial Woodland	acres	\$66,587	\$0	\$116,527	\$116,527	\$116,527	\$116,527	\$116,527	\$116,527	\$116,527	\$116,527	\$0	\$0
Coastal and Valley Freshwater Marsh	acres	\$100,062	\$0	\$562,849	\$562,849	\$562,849	\$562,849	\$562,849	\$562,849	\$562,849	\$562,849	\$0	\$0
Seasonal Wetland	acres	\$112,385	\$0	\$421,442	\$421,442	\$421,442	\$421,442	\$421,442	\$421,442	\$421,442	\$421,442	\$0	\$0
Ponds	acres	\$86,282	\$0	\$776,538	\$776,538	\$776,538	\$776,538	\$776,538	\$776,538	\$776,538	\$776,538	\$0	\$0
Streams (with Ogier Ponds adjustment)	linear feet	\$447	\$0	\$3,068,585	\$3,068,585	\$3,068,585	\$3,068,585	\$3,068,585	\$3,068,585	\$3,068,585	\$3,068,585	\$0	\$0
Ogier Ponds project	dollars	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total before contingency			\$0	\$8,160,593	\$8,160,593	\$8,160,593	\$8,160,593	\$8,160,593	\$8,160,593	\$8,160,593	\$8,160,593	\$0	\$0
Restoration contingency			\$0	\$1,224,089	\$1,224,089	\$1,224,089	\$1,224,089	\$1,224,089	\$1,224,089	\$1,224,089	\$1,224,089	\$0	\$0

Assumptions / Notes:

All restoration projects implemented by year 40.

Reserve staff would prepare restoration management plans.

Restoration planning, design, and implementation will be accomplished through a combination of contractors with staff oversight and management.

The estimate of construction costs is a planning tool to assess the level of effort required to perform the work. Actual construction costs may vary from the above estimates because of competitive bidding, negotiations with the client, or fluctuations in market prices. This is not a bid.

Plan, specification, and engineering work, bid assistance, and construction oversight are accounted for in the 5-year period in which construction takes place.

Five years of post-construction maintenance will be conducted in the 5-year period after construction takes place.

Post-construction restoration monitoring and maintenance is a 5-year period of staff monitoring and contractor remediation to ensure successful implementation of plan drawings,

15% Contingency factor for restoration/creation; assumed to be higher than standard contingency

0.0 Miles of stream restored in Ogier Ponds project, expected in years 6-10

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-4: Habitat Restoration/Creation  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**G-4c Environmental Compliance for Restoration Projects**

Number Projects Requiring Environmental Compliance

Project size	Size Range	Number of projects per period										Total	
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45		46-50
Small/simple	up to 10 acres or up to 0.1 stream miles	-	9	9	9	9	9	9	9	7	-	-	70
Medium/more complex	10.1-50 acres or 0.1-0.5 stream miles	-	5	5	5	5	5	5	5	-	-	-	35
Large/most complex	over 50 acres or 0.5 stream miles	-	1	1	1	1	1	1	1	-	-	-	7
Total projects		-	15	15	15	15	15	15	15	7	-	-	112

Assumptions / Notes:

**12.50%** Percentage of projects requiring compliance in each 5-year period between years 1 and 40; linked to restoration over time

Cost per Project Size and Compliance Category

Project size	Compliance Category			Total
	CWA 404/401	CDFG 1602	Other	
Small/simple	\$5,300	\$2,650	\$10,600	\$18,550
Medium/more complex	\$10,600	\$4,240	\$10,600	\$25,440
Large/most complex	\$26,500	\$8,480	\$10,600	\$45,580

For 401/404 and 1602 compliance, varying costs have more to do with project complexity than with project size.

Clean Water Act and 1602 permits will be done on a per-project basis; a Regional General Permit and Master 1602 Agreement will be available for small to medium projects.

All compliance costs include application or other fees

**401/404**

The cost of conducting wetland delineations is not included under CWA 404/401 compliance; it is expected that delineation would be covered under land acquisition costs.

Each project implemented under the HCP will qualify for compliance under the regional permit program for the inventory area

Tasks associated with Section 402 compliance are not included in this cost estimate.

**1602**

All projects except large ones would qualify for the Master 1602 for the inventory area

**Other**

The "other" compliance category could include county grading permits, road encroachment permits, or other local approvals.

Includes preparation of a Storm Water Pollution Prevention Plan (SWPPP) in compliance with Regional Water Quality Control Board General Construction Permit.

Applicable to any project resulting in more than one acre of ground disturbance, assumed to be most restoration projects.

**Table G-4d: Staff (shared with administration, reserve management, and monitoring)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total employee cost per period	\$0	\$575,978	\$820,142	\$982,918	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration

The cost/employee/year includes salary and benefits.

**Table G-4e: Office Equipment and Supplies (shared with administration, reserve management, and monitoring)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Furniture and equipment purchase	\$0	\$8,867	\$11,625	\$14,024	\$15,458	\$20,578	\$14,716	\$15,384	\$14,716	\$20,578	\$14,716
Equipment maintenance and supplies	\$0	\$6,956	\$11,470	\$13,727	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration

**Table G-4f: Passenger Vehicles and Fuel (shared with administration, reserve management, and monitoring)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger car purchase	\$0	\$7,568	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0
Vehicle fuel and maintenance	\$0	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration

**Table G-4g: Vehicle Mileage Allowance (shared with administration, reserve management, and monitoring)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration

**Table G-4h: Overnight Travel (shared with administration, reserve management, and monitoring)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period	\$0	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration

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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-4: Habitat Restoration/Creation  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-4i: Long-term management**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Restored pond acres managed (cumulative total)	0.0	9.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	72.0	72.0
Restored acres managed for feral pigs (cumulative)	0.0	47.9	95.8	143.6	191.5	239.4	287.3	335.1	383.0	383.0	383.0
Restored acres managed for cowbird (cumulative)	0.0	42.4	84.8	127.1	169.5	211.9	254.3	296.6	339.0	339.0	339.0
Cost of feral pig management per period	\$0	\$317	\$634	\$952	\$1,269	\$1,586	\$1,903	\$2,220	\$2,537	\$2,537	\$2,537
Cost to control brown headed cowbird, per period	\$0	\$6,738	\$13,475	\$20,213	\$26,951	\$33,688	\$40,426	\$47,163	\$53,901	\$53,901	\$53,901
Cost to control non-native fish in ponds, per period	\$0	\$1,431	\$2,862	\$4,293	\$5,724	\$7,155	\$8,586	\$10,017	\$11,448	\$11,448	\$11,448
Pond maintenance	\$0	\$14,310	\$28,620	\$42,930	\$57,240	\$71,550	\$85,860	\$100,170	\$114,480	\$114,480	\$114,480
Operational cost per period	\$0	\$22,796	\$45,592	\$68,387	\$91,183	\$113,979	\$136,775	\$159,571	\$182,366	\$182,366	\$182,366
Remedial measures for long-term mngmt.	\$0	\$2,280	\$4,559	\$6,839	\$9,118	\$11,398	\$13,677	\$15,957	\$18,237	\$18,237	\$18,237

Assumptions / Notes:

Invasive species management on restored lands assumes grassland is restored to wetlands. While some other land covers may also be restored to wetlands, the majority will be grasslands.

\$32 Cost to control brown-headed cowbird per year per acre managed. Would occur periodically in strategic locations throughout the reserve system.

0.50 Acres per pond (Table 5-12)

30% Percent of ponds managed for control of non-native fish

0.5 Number of management activities (applications) per pond per year to control non-native fish assuming management occurs every other year.

\$106 Cost to control non-native fish per pond per application (supplies only, not labor).

Note: Management activities for non-native fish will be done by reserve staff. Costs for management for non-native fish in ponds in existing open space covered in Table G-5m.

**Table G-4j: Long-term biological monitoring**

	Biological Monitoring Cost Per Period by Species										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Covered Species Monitoring											
Restored acres monitored for RLF and TCBB	0.0	62.5	125.0	187.5	250.0	312.5	375.0	437.5	500.0	500.0	500.0
Restored acres monitored for CTS	0.0	18.4	36.8	55.1	73.5	91.9	110.3	128.6	147.0	147.0	147.0
Restored acres monitored for WPT	0.0	58.8	117.5	176.3	235.0	293.8	352.5	411.3	470.0	470.0	470.0
Restored stream miles monitored for YLF	0.0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	10.4	10.4
Restored acres monitored for LBV	0.0	44.1	88.3	132.4	176.5	220.6	264.8	308.9	353.0	353.0	353.0
California Red-Legged Frog	\$0	\$11,989	\$23,978	\$31,276	\$41,701	\$52,126	\$62,551	\$72,976	\$83,402	\$83,402	\$83,402
California Tiger Salamander	\$0	\$26,490	\$52,980	\$69,104	\$92,139	\$115,174	\$138,209	\$161,244	\$184,278	\$184,278	\$184,278
Western Pond Turtle	\$0	\$422	\$844	\$1,100	\$1,467	\$1,834	\$2,201	\$2,568	\$2,934	\$2,934	\$2,934
Foothill Yellow-Legged Frog (streams)	\$0	\$2,258	\$4,515	\$5,889	\$7,853	\$9,816	\$11,779	\$13,742	\$15,705	\$15,705	\$15,705
Least Bell's Vireo	\$0	\$5,699	\$11,398	\$14,867	\$19,823	\$24,779	\$29,735	\$34,691	\$39,646	\$39,646	\$39,646
Tricolor Blackbird	\$0	\$2,862	\$5,725	\$7,467	\$9,956	\$12,445	\$14,933	\$17,422	\$19,911	\$19,911	\$19,911
Cost per period	\$0	\$49,720	\$99,440	\$129,704	\$172,939	\$216,173	\$259,408	\$302,643	\$345,877	\$345,877	\$345,877
Natural Communities Monitoring											
Restored Riparian Forest and Scrub	0.0	44.1	88.3	132.4	176.5	220.6	264.8	308.9	353.0	353.0	353.0
Restored Wetland	0.0	9.4	18.8	28.1	37.5	46.9	56.3	65.6	75.0	75.0	75.0
Restored Open Water (ponds)	0.0	9.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	72.0	72.0
Riparian Forest and Scrub	\$0	\$2,497	\$4,993	\$6,513	\$8,684	\$10,855	\$13,026	\$15,197	\$17,368	\$17,368	\$17,368
Wetland	\$0	\$11,276	\$22,551	\$29,415	\$39,220	\$49,025	\$58,829	\$68,634	\$78,439	\$78,439	\$78,439
Open Water (aquatic)	\$0	\$526	\$1,052	\$1,373	\$1,830	\$2,288	\$2,745	\$3,203	\$3,660	\$3,660	\$3,660
Cost per period	\$0	\$14,298	\$28,597	\$37,300	\$49,734	\$62,167	\$74,601	\$87,034	\$99,467	\$99,467	\$99,467

Assumptions / Notes:

	Annual cost based on person hours per year for complete reserve system	Annual cost per acre or mile monitored
Covered Species on Restored Land		
California Red-legged Frog	\$72,281	\$56
California Tiger Salamander	\$62,680	\$418
Western Pond Turtle	\$14,567	\$2
Foothill Yellow-Legged Frog (streams, miles)	\$15,101	\$503
Least Bell's Vireo	\$22,463	\$37
Tricolor Blackbird	\$13,274	\$13
15% Percent premium on costs in years 1 - 10 to reflect more intensive early efforts and the fact that monitoring would become more efficient over time.		
Land Covers for Natural Communities Monitoring on Restored Land		
Riparian Forest and Scrub	\$15,924	\$16
Wetland	\$54,036	\$349
Open Water (aquatic)	\$3,000	\$17

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-5: Reserve Management and Maintenance  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Capital Budget, with restored lands adjustment												
Furniture and equipment purchase	\$0	\$20,046	\$20,493	\$24,800	\$25,281	\$33,475	\$24,539	\$26,161	\$23,585	\$32,521	\$24,539	\$255,441
Vehicle purchase	\$0	\$81,344	\$72,080	\$127,497	\$103,880	\$127,497	\$103,880	\$127,497	\$95,400	\$119,017	\$103,880	\$1,061,972
Other equipment purchase	\$0	\$60,337	\$120,674	\$181,011	\$241,348	\$301,685	\$362,022	\$422,359	\$482,696	\$543,033	\$543,033	\$3,258,196
Field facilities - construction cost	\$0	\$557,295	\$0	\$0	\$557,295	\$0	\$557,295	\$0	\$0	\$0	\$0	\$1,671,885
Wells and water pumping equipment	\$0	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$0	\$858,600
Contractors - capital	\$0	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$334,298	\$4,519,119
Remedial measures	\$0	\$228,556	\$745,968	\$739,066	\$820,126	\$878,598	\$880,444	\$895,619	\$894,179	\$894,179	\$894,179	\$7,795,016
<b>Capital Subtotal</b>	<b>\$0</b>	<b>\$1,507,959</b>	<b>\$1,519,595</b>	<b>\$1,632,754</b>	<b>\$2,306,464</b>	<b>\$1,843,163</b>	<b>\$2,486,714</b>	<b>\$2,016,840</b>	<b>\$2,057,680</b>	<b>\$2,149,130</b>	<b>\$1,899,929</b>	<b>\$19,420,228</b>
Operational Budget, with restored lands adjustment												
Reserve staff	\$0	\$1,058,940	\$1,303,104	\$1,465,881	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$15,228,523
Overnight travel	\$0	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$8,116
Vehicle mileage allowance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Office equipment maintenance and supplies	\$0	\$15,101	\$19,614	\$22,401	\$24,658	\$24,658	\$24,658	\$24,658	\$24,128	\$24,128	\$24,128	\$228,134
Vehicle fuel and maintenance	\$0	\$52,631	\$52,631	\$57,351	\$57,351	\$57,351	\$57,351	\$57,351	\$52,631	\$52,631	\$52,631	\$549,905
Vehicle/equipment rental	\$0	\$26,267	\$52,533	\$78,800	\$105,067	\$131,333	\$157,600	\$183,867	\$210,134	\$236,400	\$236,400	\$1,418,401
Other equipment and materials - operational	\$0	\$10,056	\$67,667	\$99,646	\$131,624	\$163,603	\$195,582	\$227,560	\$259,539	\$291,517	\$291,517	\$1,739,312
Field facilities maintenance and utilities	\$0	\$66,250	\$66,250	\$66,250	\$132,500	\$132,500	\$198,750	\$198,750	\$198,750	\$198,750	\$198,750	\$1,457,500
Permanent seed bank	\$0	\$63,600	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$63,600
Water pumping	\$0	\$2,650	\$5,300	\$7,950	\$10,600	\$13,250	\$15,900	\$18,550	\$21,200	\$23,850	\$23,850	\$143,100
Invasive species control	\$0	\$125,240	\$250,481	\$375,721	\$500,962	\$626,202	\$751,443	\$876,683	\$1,001,923	\$1,126,650	\$1,126,650	\$6,779,954
Existing open space - County Parks	\$0	\$0	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$35,193,060
Existing open space - Open Space Authority	\$0	\$0	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$4,293,000
Contractors - operational	\$0	\$400,325	\$440,250	\$310,575	\$435,300	\$517,625	\$599,950	\$682,275	\$764,600	\$846,925	\$846,925	\$5,873,373
Environmental compliance	\$0	\$417,110	\$417,110	\$417,110	\$417,110	\$417,110	\$417,110	\$417,110	\$55,650	\$0	\$0	\$2,975,420
<b>Operational Subtotal</b>	<b>\$0</b>	<b>\$2,238,981</b>	<b>\$7,063,092</b>	<b>\$7,289,836</b>	<b>\$7,831,980</b>	<b>\$8,100,441</b>	<b>\$8,435,152</b>	<b>\$8,703,612</b>	<b>\$8,605,363</b>	<b>\$8,840,970</b>	<b>\$8,840,970</b>	<b>\$75,950,398</b>
<b>Total</b>	<b>\$0</b>	<b>\$3,746,940</b>	<b>\$8,582,687</b>	<b>\$8,922,591</b>	<b>\$10,138,445</b>	<b>\$9,943,604</b>	<b>\$10,921,865</b>	<b>\$10,720,453</b>	<b>\$10,663,043</b>	<b>\$10,990,100</b>	<b>\$10,740,898</b>	<b>\$95,370,626</b>

**Table G-5a: Reserve Management Employee Costs (including shared staff costs)**

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per employee per year	Number of FTEs per year by period										
				0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve Manager	\$90,100	35%	\$121,635	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Laborer	\$53,000	35%	\$71,550	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administrative Assistant	\$53,000	35%	\$71,550	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total FTEs				0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Employee cost per year				\$0	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593	\$96,593
Employee cost per period				\$0	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963	\$482,963
Shared staff cost per period				\$0	\$575,978	\$820,142	\$982,918	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694	\$1,145,694
Employee cost per period				\$0	\$1,058,940	\$1,303,104	\$1,465,881	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657	\$1,628,657

Assumptions / Notes:

35% Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

Admin - Secretary time is allocated 50% to program administration and 50% to reserve management.

**Table G-5b: Office Equipment and Supplies by Employee (including shared costs)**

Equipment type	Cost per employee per year	Cost of service contract per year	Number of FTEs / vehicles with equipment											
			0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
			Total FTEs											
Cubicle furniture	\$2 120	-	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Office supplies (annual)	\$530	-	-	1	1	1	1	1	1	1	1	1	1	1
Computers	\$2 650	\$265	-	2	2	2	2	2	2	2	2	2	2	2
Cell phones	\$636	\$127	-	3	3	3	3	3	3	3	3	3	3	3
Mobile radios purchased	\$954	-	-	3	3	3	5	4	5	4	5	3	4	3
Total mobile radios	\$105	-	-	3	3	3	4	4	4	4	3	3	3	3
Furniture and equipment purchase (capital) cost per period			\$0	\$11,179	\$8,869	\$10,777	\$9,823	\$12,897	\$9,823	\$10,777	\$8,869	\$11,943	\$9,823	\$11,943
Shared furniture and equipment (capital) cost per period			\$0	\$8,867	\$11,625	\$14,024	\$15,458	\$20,578	\$14,716	\$15,384	\$14,716	\$20,578	\$14,716	\$14,716
Total furniture and equipment purchase (capital) cost per period			\$0	\$20,046	\$20,493	\$24,800	\$25,281	\$33,475	\$24,539	\$26,161	\$23,585	\$32,521	\$24,539	\$24,539
Maintenance, supplies, radio system cost per year			\$0	\$1,629	\$1,629	\$1,735	\$1,735	\$1,735	\$1,735	\$1,735	\$1,629	\$1,629	\$1,629	\$1,629
Maintenance, supplies, radio system cost per period			\$0	\$8,144	\$8,144	\$8,674	\$8,674	\$8,674	\$8,674	\$8,674	\$8,144	\$8,144	\$8,144	\$8,144
Shared maintenance and supplies cost per period			\$0	\$6,956	\$11,470	\$13,727	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984	\$15,984
Total maintenance and supplies cost per period			\$0	\$15,101	\$19,614	\$22,401	\$24,658	\$24,658	\$24,658	\$24,658	\$24,128	\$24,128	\$24,128	\$24,128

Assumptions / Notes:

20 year replacement period for cubicle office furniture (per employee)

1 year replacement period for office supplies

3 year replacement period for computers

2 year replacement period for cell phones

1 Mobile radio per vehicle

35% Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-5: Reserve Management and Maintenance  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-5c: Overnight Travel (including shared cost)**

Position	Days of travel per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve Manager	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Administrative Assistant	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Travel cost per year	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Travel cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shared travel cost per period	\$0	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812
	Travel cost per period	\$0	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812	\$812

Assumptions / Notes:

**\$186** Travel allowance per diem  
**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

Travel includes offsite travel. Travel in the course of HCP/NCCP reserve management is covered under the vehicles, maintenance, and fuel cost category below.

**Table G-5d: Passenger Vehicles and Fuel (shared with administration, restoration, and monitoring)**

Cost per period	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger car purchase	\$0	\$7,568	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0	\$15,137	\$0
Vehicle fuel and maintenance	\$0	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967	\$4,967

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

**Table G-5e: Vehicle Mileage Allowance (shared with administration, restoration, and monitoring)**

Cost per period	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

**35%** Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

**Table G-5f: Vehicles, Maintenance, and Fuel**

	Purchase price per vehicle	Fuel cost per vehicle per year	Maintenance cost per vehicle per year	Number of vehicles										
				0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
New 4WD trucks purchased, per period	\$31,800			-	2	2	3	3	3	3	3	3	3	3
Old 4WD trucks retired, per period				-	-	-	2	3	3	3	3	3	3	3
Total 4WD trucks, per year, per period		\$2,120	\$2,080	-	2	2	2	2	2	2	2	2	2	2
New ATVs and trailers purchased, per period	\$8,480			-	1	1	2	1	2	1	2	1	1	1
Old ATVs and trailers retired, per period				-	1	1	1	1	2	1	2	1	1	1
Total ATVs and trailers, per year, per period		\$424	\$520	-	1	1	2	2	2	2	2	1	1	1
		Vehicle purchase cost per period		\$0	\$73,776	\$72,080	\$112,360	\$103,880	\$112,360	\$103,880	\$112,360	\$95,400	\$103,880	\$103,880
		Vehicle fuel and maintenance per year		\$0	\$9,533	\$9,533	\$10,477	\$10,477	\$10,477	\$10,477	\$10,477	\$9,533	\$9,533	\$9,533
		Vehicle fuel and maintenance cost per period		\$0	\$47,664	\$47,664	\$52,384	\$52,384	\$52,384	\$52,384	\$52,384	\$47,664	\$47,664	\$47,664

Assumptions / Notes:

Assumes Administrative Director uses implementing entity-owned passenger car and field staff use owned trucks, see G-2c and G-5f

**G-5g: Leased Vehicles and Equipment**

	Vehicle and equipment lease costs										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres managed (cumulative total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Tractor rental cost per year	\$0	\$1,850	\$3,701	\$5,551	\$7,401	\$9,252	\$11,102	\$12,952	\$14,803	\$16,653	\$16,653
Small tractor rental cost per year	\$0	\$1,046	\$2,092	\$3,138	\$4,183	\$5,229	\$6,275	\$7,321	\$8,367	\$9,413	\$9,413
Dump truck rental cost per year	\$0	\$1,569	\$3,138	\$4,706	\$6,275	\$7,844	\$9,413	\$10,981	\$12,550	\$14,119	\$14,119
Fire truck rental cost per year	\$0	\$788	\$1,577	\$2,365	\$3,154	\$3,942	\$4,730	\$5,519	\$6,307	\$7,096	\$7,096
Vehicle and equipment rental cost per year	\$0	\$5,253	\$10,507	\$15,760	\$21,013	\$26,267	\$31,520	\$36,773	\$42,027	\$47,280	\$47,280
Vehicle and equipment rental cost period	\$0	\$26,267	\$52,533	\$78,800	\$105,067	\$131,333	\$157,600	\$183,867	\$210,134	\$236,400	\$236,400

Assumptions / Notes:

Type of vehicle leased	Daily rental cost	Days per 1,000 acres per year
Tractor	\$244	2
Small tractor	\$138	2
Dump truck	\$207	2
Fire truck	\$104	2

**Table G-5h: Equipment, Materials, and Data**

	Number of new units bought per period										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres managed (cumulative total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Capital cost of equipment and materials per year	\$0	\$12,067	\$24,135	\$36,202	\$48,270	\$60,337	\$72,404	\$84,472	\$96,539	\$108,607	\$108,607
Operational cost of equipment, materials, and data per year	\$0	\$2,011	\$13,533	\$19,929	\$26,325	\$32,721	\$39,116	\$45,512	\$51,908	\$58,303	\$58,303
Capital cost per period	\$0	\$60,337	\$120,674	\$181,011	\$241,348	\$301,685	\$362,022	\$422,359	\$482,696	\$543,033	\$543,033
Operational cost per period	\$0	\$10,056	\$67,667	\$99,646	\$131,624	\$163,603	\$195,582	\$227,560	\$259,539	\$291,517	\$291,517

Assumptions / Notes:

**\$3,180** Capital cost of other equipment (e.g., hand-held tools and machines) and non-liquid materials (e.g., road gravel) per 1,000 reserve acres per year  
**\$530** Operational cost of equipment per 1,000 reserve acres per year  
**\$3,710** Cost per period to acquire aerial photos every 5 years to re-map land cover. Labor provided by Implementing Entity staff.

Capital costs include the capital component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.  
Operational costs include the operational component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.  
Operational costs also include portable radios, small pumps, piping, generator, saw, and demolition hammers.  
Grazing is assumed to be an important tool in landscape management on ranchland under conservation easements or grazing leases.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-5: Reserve Management and Maintenance  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-5i: Field Facilities**

	Number of facilities and facility construction costs per period										
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres managed (cumulative total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Number of field facilities	-	1	1	1	2	2	3	3	3	3	3
New field facilities	-	1	-	-	1	-	1	-	-	-	-
Field facility construction cost per period	\$0	\$557,295	\$0	\$0	\$557,295	\$0	\$557,295	\$0	\$0	\$0	\$0
New native plant nurseries constructed	-	-	-	-	-	-	-	-	-	-	-
Native plant nursery construction cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total facility construction cost per period	\$0	\$557,295	\$0	\$0	\$557,295	\$0	\$557,295	\$0	\$0	\$0	\$0
Establish permanent seed bank for 6 species	\$0	\$63,600	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

10,000	Threshold for acres of reserve served by each workshop/parking area
\$530,000	Cost to build a workshop/parking area
\$0	Cost to build native plant nursery (\$75,000)
\$795	Cost of pre-construction surveys per project
5%	Construction oversight and monitoring as percent of construction cost
\$63,600	One-time cost to establish permanent seed bank collection

Field facilities contain an area for equipment storage, a manager's office, a shared office, a locker room, restrooms, and a parking area.

Native plant nursery facilities assumed shared with other land management entities.

The seed bank collection will be established at the Rancho Santa Ana Botanic Gardens (or similar institution). Costs account for seed bank collection design, collection time by consultants or implementing Entity staff,

seed banking fees at the storage institution, and miscellaneous expenses.

Six covered plant species would be established at the permanent seed bank: Santa Clara Valley dudleya, coyote ceanothus, most beautiful jewel-flower, Metcalf Canyon jewel-flower, smooth lessingia, and Mt. Hamilton thistle.

Seed bank established during years 1 - 5.

**Table G-5j: Facilities Maintenance and Utilities**

	Cost per facility per year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total field facilities per period	-	-	1	1	1	2	2	3	3	3	3	3
Total native plant nurseries per period	-	-	-	-	-	1	1	1	1	1	1	1
Field facilities maintenance cost per year	\$10,600	\$0	\$10,600	\$10,600	\$10,600	\$21,200	\$21,200	\$31,800	\$31,800	\$31,800	\$31,800	\$31,800
Field facilities utilities cost per year	\$2,650	\$0	\$2,650	\$2,650	\$2,650	\$5,300	\$5,300	\$7,950	\$7,950	\$7,950	\$7,950	\$7,950
Native plant nursery operating cost per year	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cost per year	\$0	\$0	\$13,250	\$13,250	\$13,250	\$26,500	\$26,500	\$39,750	\$39,750	\$39,750	\$39,750	\$39,750
Cost per period	\$0	\$0	\$66,250	\$66,250	\$66,250	\$132,500	\$132,500	\$198,750	\$198,750	\$198,750	\$198,750	\$198,750

**Table G-5k: Wells and Water Pumping**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres managed (cumulative total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Number of wells added on reserve	-	2	2	2	2	2	2	2	2	2	-
Total wells on reserve	-	2	4	6	8	10	12	14	16	18	18
Capital cost per period for well and pump system	\$0	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$95,400	\$0
Operational cost per year	\$0	\$530	\$1,060	\$1,590	\$2,120	\$2,650	\$3,180	\$3,710	\$4,240	\$4,770	\$4,770
Operational cost per period	\$0	\$2,650	\$5,300	\$7,950	\$10,600	\$13,250	\$15,900	\$18,550	\$21,200	\$23,850	\$23,850

Assumptions / Notes:

0.5	Number of wells per 1,000 acres
\$31,800	Cost to drill a well
\$15,900	Cost of pump and related equipment
\$265	Annual cost to operate pump per well/pump.

**Table G-5l: Invasive Species Control (For all acres managed, including restored acres. Restoration share calculated in G-4i. Reserve management total above deducts cost allocated to restored lands.)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve acres acquired and managed (total)	-	3,795	7,590	11,384	15,179	18,974	22,769	26,563	30,358	34,153	34,153
Acres managed with applications of herbicides	-	1,789	3,578	5,367	7,156	8,944	10,733	12,522	14,311	16,100	16,100
Acres managed with prescribed burns	-	138	276	414	552	690	828	966	1,104	1,242	1,242
Acres managed for feral pigs	-	3,628	7,256	10,884	14,512	18,139	21,767	25,395	29,023	32,651	32,651
Acres managed to control brown-headed cowbird	-	102	204	306	408	509	611	713	815	917	917
Number of ponds managed for non-native fish	-	12	24	35	47	59	71	83	94	106	106
Weed management supplies per year	\$0	\$2,011	\$4,022	\$6,034	\$8,045	\$10,056	\$12,067	\$14,079	\$16,090	\$18,101	\$18,101
Cost of herbicide applications per year	\$0	\$9,481	\$18,962	\$28,443	\$37,924	\$47,406	\$56,887	\$66,368	\$75,849	\$85,330	\$85,330
Cost of prescribed burns per year	\$0	\$6,580	\$13,161	\$19,741	\$26,322	\$32,902	\$39,483	\$46,063	\$52,644	\$59,224	\$59,224
Cost of feral pig management per year	\$0	\$4,807	\$9,614	\$14,421	\$19,228	\$24,035	\$28,842	\$33,649	\$38,456	\$43,263	\$43,263
Cost to control brown headed cowbird, per year	\$0	\$3,240	\$6,480	\$9,720	\$12,960	\$16,200	\$19,440	\$22,680	\$25,921	\$29,161	\$29,161
Cost to control non-native fish in ponds, per year	\$0	\$625	\$1,251	\$1,876	\$2,502	\$3,127	\$3,752	\$4,378	\$5,003	\$5,629	\$5,629
Cost per year	\$0	\$26,745	\$53,490	\$80,236	\$106,981	\$133,726	\$160,471	\$187,217	\$213,962	\$240,707	\$240,707
Cost per period	\$0	\$133,726	\$267,452	\$401,179	\$534,905	\$668,631	\$802,357	\$936,084	\$1,069,810	\$1,203,536	\$1,203,536

Assumptions / Notes:

\$530	Cost of weed management supplies (not labor) per 1,000 acres of reserve per year, for hand spraying. Applies to all reserve acres
\$27	Cost of applications of herbicides per period per acre managed
\$48	Cost of prescribed burns per acre burned
\$1,325	Cost of feral pig management per year per 1,000 acres managed
\$32	Cost to control brown-headed cowbird per year per acre managed. Would occur periodically in strategic locations throughout the reserve system.
1,242	Acres managed with prescribed burns (total in year 50)
177	Acres of ponds acquired and restored in lieu of herbicides and prescribed burns. Some rangeland may be leased for grazing and some ranchland acquired with conservation easements will be grazed.
0.5	Acres per pond (Table 5-12)
30%	Percent of ponds managed for control of non-native fish
0.5	Number of management activities (applications) per pond per year to control non-native fish assuming management occurs every other year.
\$106	Cost to control non-native fish per pond per application (supplies only, not labor).

Note: Bullfrog management activities will be conducted by reserve staff. All herbicides applied according to label instructions. Pesticides may be applied using aerial, truck, or hand application.

Grazing will be used as applicable for weed management in lieu of herbicides and prescribed burns. Some rangeland may be leased for grazing and some ranchland acquired with conservation easements will be grazed.

Note: Management activities for non-native fish will be done by reserve staff. Costs for management for non-native fish in ponds in existing open space covered in Table G-5m.

Invasive species control on restored wetlands covered as a restoration cost.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-5: Reserve Management and Maintenance  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-5m: Management of existing open space**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period for County Parks	\$0	\$0	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340	\$3,910,340
Cost per period for Open Space Authority lands	\$0	\$0	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000	\$477,000

Assumptions / Notes:

\$782,068	Annual cost to manage existing open space (County parks managed for the Habitat Plan)
\$95,400	Annual cost to manage existing open space (Open Space Authority lands managed for the Habitat Plan)

Management activities begin in year 6.

Does not include other costs such as recreation and law enforcement / public safety because those services are already provided by County Parks and the County Sheriff.

**Table G-5n: Contractors - for on-going management and maintenance** (For all acres acquired, including restored acres. Restoration share calculated in G-4i. Reserve management total above deducts cost allocated to restored lands.)

Contractor category	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Reserve unit management plans and updates	\$0	\$318,000	\$275,600	\$63,600	\$106,000	\$106,000	\$106,000	\$106,000	\$106,000	\$106,000	\$106,000
Total pond area (cumulative)	-	20	39	59	79	98	118	138	157	177	177
Total miles of dirt (ranch) road (cumulative)	-	3	6	9	11	14	17	20	23	26	26
Total reserve area (cumulative)	-	3,795	7,590	11,384	15,178	18,974	22,769	26,563	30,358	34,153	34,153
Pond maintenance	\$0	\$31,270	\$62,540	\$93,810	\$125,080	\$156,350	\$187,620	\$218,890	\$250,160	\$281,430	\$281,430
Dirt (ranch) road maintenance	\$0	\$15,084	\$30,168	\$45,253	\$60,337	\$75,421	\$90,505	\$105,590	\$120,674	\$135,758	\$135,758
Other maintenance services	\$0	\$50,281	\$100,562	\$150,842	\$201,123	\$251,404	\$301,685	\$351,966	\$402,246	\$452,527	\$452,527
Cost per period	\$0	\$414,635	\$468,870	\$353,505	\$492,540	\$589,175	\$685,810	\$782,445	\$879,080	\$975,715	\$975,715

Assumptions / Notes:

\$106,000	Reserve unit management plans: One for each of five reserve units. Cost per initial plan. First 3 written in first five years and another 2 written in second five years.
\$21,200	Cost to update reserve unit management plan once every 5 years.
\$1,590	Cost for pond maintenance (dredging) per acre of pond every 5 years
\$1,060	Cost of dirt (ranch) road maintenance per mile of road per year
0.75	Miles of dirt (ranch) road constructed, per 1,000 acres acquired
\$2,650	Cost for other maintenance services per 1,000 acres of reserve per year

Costs for Neighboring Landowner Agreement baseline and land cover surveys would be incurred by the landowner.

Other maintenance services include mowing, grading, pest control, diskling for fire breaks, fencing, alarms, janitorial services, removing debris associated with illegal marijuana cultivation.

Pond maintenance services on restored ponds covered as a restoration cost.

**Table G-5n: Contractors - capital costs for construction services including roadway design, paving, fencing, grading, and surveying services**

Contractor category	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total miles of paved roads (cumulative)	-	-	-	-	-	-	-	-	-	-	-
Paved road construction	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Dirt (ranch) road construction	\$0	\$130,683	\$130,683	\$130,683	\$130,683	\$130,683	\$130,683	\$130,683	\$130,683	\$130,683	\$0
Bridge installation	\$0	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298	\$334,298
Wildlife linkages implementation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cost per period	\$0	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$464,980	\$334,298

Assumptions / Notes:

\$84,800	Cost for paved road construction per mile
\$42,400	Cost for dirt (ranch) road construction per mile
-	Miles of paved road constructed, per 1,000 acres acquired
0.75	Miles of dirt (ranch) road constructed, per 1,000 acres acquired
1	Number of vehicle bridges installed per period
\$636,000	Cost per vehicle bridge to install
-	Number of trail bridges installed per period
\$22,260	Cost per trail bridge to install
\$795	Cost of pre-construction surveys (per year for road construction and per project for bridge installation)
5%	Construction oversight and monitoring as percent of construction cost
\$0	Seed money to implement recommendations of feasibility study regarding wildlife linkages (originally \$1,500,000)

\$814,549  
\$2,715,164

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-5: Reserve Management and Maintenance  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**G-5o Environmental Compliance for Reserve Management Projects**

Number Projects Requiring Environmental Compliance

Project size	Size Range	Number of projects per period										Total	
		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45		46-50
Small/simple	up to 10 acres or up to 0.1 stream miles	-	9	9	9	9	9	9	9	7	-	-	70
Medium/more complex	10.1-50 acres or 0.1-0.5 stream miles	-	5	5	5	5	5	5	5	-	-	-	35
Large/most complex	over 50 acres or 0.5 stream miles	-	1	1	1	1	1	1	1	-	-	-	7
Total projects		-	15	15	15	15	15	15	15	7	-	-	112

Assumptions / Notes:

**12.50%** Percentage of projects requiring compliance in each 5-year period between years 1 and 40; linked to restoration over time

Cost per Project Size and Compliance Category

Project size	Compliance Category		
	NEPA/CEQA	NHPA	Total
Small/simple	\$5,300	\$2,650	\$7,950
Medium/more complex	\$42,400	\$3,710	\$46,110
Large/most complex	\$106,000	\$9,010	\$115,010

For NEPA/CEQA compliance, varying costs have more to do with project complexity than with project size.

Cultural compliance permits will be done on a per-project basis.

All compliance costs include application or other fees

All land acquisitions would be a categorical exemption under CEQA as well as under NEPA, when NEPA applies.

**NEPA/CEQA**

Depending on the level of detail that is provided for specific projects, they may or may not be able to be covered under the HCP EIR/EIS.

For those without sufficient detail, additional environmental documentation may need to be prepared.

It is likely that the majority of those would be in the form of mitigated negative declarations.

Because it is difficult to provide a cost estimate for a project without knowing details such as location, size, etc.,

the following are some rough numbers based on level of controversy:

Small scale non-controversial projects = Cat Excl/Cat Exemp

Medium scale more controversial projects = IS MND/EA FONSI

Larger scale more controversial projects = EIR/EIS

**NHPA**

Archaeological surveys can be conducted at an intensive level at a rate of 40 acres per person per day.

No more than one cultural resource will be identified per 40 acres or part thereof.

This scope of work and cost estimate does not include tasks necessary for significance evaluations and resolution of adverse effects.

**G-5p: Remedial Measures**

Capital Budget	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Remedial measures	\$0	\$228,556	\$745,968	\$739,066	\$818,280	\$820,126	\$878,598	\$880,444	\$895,619	\$894,179	\$894,179	\$7,795,016
<b>Total</b>	<b>\$0</b>	<b>\$228,556</b>	<b>\$745,968</b>	<b>\$739,066</b>	<b>\$818,280</b>	<b>\$820,126</b>	<b>\$878,598</b>	<b>\$880,444</b>	<b>\$895,619</b>	<b>\$894,179</b>	<b>\$894,179</b>	<b>\$7,795,016</b>

Assumptions / Notes:

**10%** Percent of reserve management and maintenance operational cost assumed to be needed for remedial actions on reserve lands.

Applies to operational budget for management activities on reserve lands.

Applies to western burrowing owl conservation strategy management costs from Table G-7.

Management costs include overall reserve management.

Covers costs associated with responses to adaptive management findings as well as costs for restoration or maintenance of reserve areas in response to other changed circumstances such as wildfire or drought.

Remedial measures for restoration activities are included as a restoration cost.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-6: Monitoring, Research, and Scientific Review  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Capital Budget												
Office furniture and equipment purchase	\$0	\$5,067	\$6,643	\$8,014	\$8,833	\$11,759	\$8,409	\$8,791	\$8,409	\$11,759	\$8,409	\$86,093
Vehicle purchase	\$0	\$4,325	\$0	\$8,650	\$0	\$8,650	\$0	\$8,650	\$0	\$8,650	\$0	\$38,923
<b>Capital Subtotal</b>	<b>\$0</b>	<b>\$9,392</b>	<b>\$6,643</b>	<b>\$16,663</b>	<b>\$8,833</b>	<b>\$20,409</b>	<b>\$8,409</b>	<b>\$17,441</b>	<b>\$8,409</b>	<b>\$20,409</b>	<b>\$8,409</b>	<b>\$125,016</b>
Operational Budget, with restored lands adjustment												
Monitoring staff	\$0	\$329,130	\$468,653	\$561,668	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$5,942,228
Office equipment maintenance and supplies	\$0	\$3,975	\$6,554	\$7,844	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$82,309
Vehicle fuel and maintenance	\$0	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$28,380
Vehicle mileage allowance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Overnight travel	\$0	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$4,638
Monitoring plan	\$0	\$265,000	\$0	\$53,000	\$0	\$53,000	\$0	\$53,000	\$0	\$53,000	\$0	\$477,000
Biological monitoring contractors	\$0	\$180,320	\$523,533	\$753,692	\$1,052,137	\$1,350,583	\$1,649,029	\$1,947,474	\$2,245,920	\$2,600,034	\$2,741,679	\$15,044,401
California Tiger Salamander genetic study and monitoring	\$0	\$175,220	\$337,260	\$518,220	\$146,215	\$171,649	\$197,083	\$218,278	\$235,234	\$252,190	\$260,668	\$2,512,017
Monitoring enhancement on existing open space - Co. Parks	\$0	\$142,451	\$316,558	\$298,206	\$309,676	\$316,558	\$321,145	\$324,422	\$326,880	\$328,792	\$344,084	\$3,028,773
Monitoring enhancement on existing open space - OSA land	\$0	\$11,590	\$25,755	\$24,262	\$25,195	\$25,755	\$26,129	\$26,395	\$26,595	\$26,751	\$27,995	\$246,422
Directed research	\$0	\$927,500	\$397,500	\$265,000	\$106,000	\$106,000	\$0	\$0	\$0	\$0	\$0	\$1,802,000
Scientific review	\$0	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$943,400
<b>Operational Subtotal</b>	<b>\$0</b>	<b>\$2,132,828</b>	<b>\$2,173,454</b>	<b>\$2,579,533</b>	<b>\$2,400,681</b>	<b>\$2,785,003</b>	<b>\$2,954,844</b>	<b>\$3,331,028</b>	<b>\$3,596,087</b>	<b>\$4,022,224</b>	<b>\$4,135,884</b>	<b>\$30,111,567</b>
<b>Total</b>	<b>\$0</b>	<b>\$2,142,219</b>	<b>\$2,180,097</b>	<b>\$2,596,197</b>	<b>\$2,409,515</b>	<b>\$2,805,411</b>	<b>\$2,963,253</b>	<b>\$3,348,468</b>	<b>\$3,604,497</b>	<b>\$4,042,633</b>	<b>\$4,144,294</b>	<b>\$30,236,583</b>

**Table G-6a: Staff (shared with administration, reserve management, and restoration/creation)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period	\$0	\$329,130	\$468,653	\$561,668	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683	\$654,683

Assumptions / Notes:

20% Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

The cost/employee/year includes salary and benefits.

**Table G-6b: Office Equipment and Supplies (shared with administration, reserve management, and restoration/creation)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period											
Furniture and equipment purchase	\$0	\$5,067	\$6,643	\$8,014	\$8,833	\$11,759	\$8,409	\$8,791	\$8,409	\$11,759	\$8,409
Equipment maintenance and supplies	\$0	\$3,975	\$6,554	\$7,844	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134	\$9,134

Assumptions / Notes:

20% Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

**Table G-6c: Passenger Vehicles and Fuel (shared with administration, reserve management, and restoration/creation)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period											
Passenger car purchase	\$0	\$4,325	\$0	\$8,650	\$0	\$8,650	\$0	\$8,650	\$0	\$8,650	\$0
Vehicle fuel and maintenance	\$0	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838	\$2,838

Assumptions / Notes:

20% Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

**Table G-6d: Vehicle Mileage Allowance (shared with administration, reserve management, and restoration/creation)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

20% Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

**Table G-6e: Overnight Travel (shared with administration, reserve management, and restoration/creation)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period	\$0	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464	\$464

Assumptions / Notes:

20% Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

Compliance monitoring for implementation will be conducted by program administration staff and is addressed under the program administration cost category.

General landscape level surveying and monitoring will be done by staff, once every 5 years.

Pre-acquisition survey costs are covered under the land acquisition cost category.

Monitoring on lands restored/created is addressed under the restoration cost category.

Pre-construction surveys are assumed to occur prior to construction of covered activities on the reserve system, and costs are estimated as a component of those restoration and management costs.

Construction monitoring is assumed to occur periodically during construction of covered activities and conservation measures, and costs are estimated as a component of those restoration and management costs.

Implementing entity monitoring staff will plan, coordinate, and report on the monitoring categories described below.

Contractors will conduct the field monitoring and data analysis.

Annual monitoring costs assumed roughly constant over the implementation period. More intensive monitoring in early years; monitoring becomes more efficient over time.

Pre-acquisition, pre-construction surveys, and construction monitoring for covered activities outside of the reserve system will be paid for by developers.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-6: Monitoring, Research, and Scientific Review  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-6f: Biological Monitoring by species and land cover type (field data collection contractors)**

**(For all acres managed. Monitoring on restored acres calculated in G-4). Reserve monitoring total above deducts cost allocated to restored lands.)**

		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Monitoring Plan		\$0	\$265,000	\$0	\$53,000	\$0	\$53,000	\$0	\$53,000	\$0	\$53,000	\$0
	Annual cost based on person hours per year for complete reserve system											
Covered Species and Land Cover Type												
California Red-Legged Frog	\$72,281	\$0	\$27,708	\$73,888	\$104,406	\$144,563	\$184,719	\$224,876	\$265,032	\$305,188	\$345,345	\$361,407
California Red-Legged Frog - streams	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
California Tiger Salamander	\$62,680	\$0	\$24,027	\$64,073	\$90,537	\$125,360	\$160,182	\$195,004	\$229,826	\$264,648	\$299,470	\$313,399
Pond Turtle	\$14,567	\$0	\$5,584	\$14,891	\$21,042	\$29,135	\$37,228	\$45,321	\$53,414	\$61,507	\$69,600	\$72,837
Pond Turtle (streams)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Foothill Yellow-Legged Frog (streams)	\$15,101	\$0	\$5,789	\$15,437	\$21,813	\$30,202	\$38,592	\$46,981	\$55,371	\$63,760	\$72,150	\$75,505
San Joaquin Kit Fox	\$69,644	\$0	\$26,697	\$71,192	\$100,597	\$139,288	\$177,980	\$216,671	\$255,362	\$294,053	\$332,744	\$348,221
Western Burrowing Owl - overwintering	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Western Burrowing Owl - breeding	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Townsend's Bat	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Least Bell's Vireo	\$22,463	\$0	\$8,611	\$22,962	\$32,446	\$44,925	\$57,404	\$69,884	\$82,363	\$94,842	\$107,321	\$112,313
Tricolor Blackbird	\$13,274	\$0	\$5,088	\$13,569	\$19,174	\$26,548	\$33,923	\$41,298	\$48,672	\$56,047	\$63,421	\$66,371
Golden Eagle	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Bay checkerspot butterfly	\$158,639	\$0	\$60,812	\$162,165	\$229,146	\$317,279	\$405,412	\$493,545	\$581,678	\$669,810	\$757,943	\$793,197
Covered plants	\$101,045	\$0	\$38,734	\$103,290	\$145,954	\$202,090	\$258,226	\$314,362	\$370,498	\$426,634	\$482,771	\$505,225
Townsend's bat maternity colonies	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Cost per period	\$0	\$203,050	\$541,466	\$765,115	\$1,059,390	\$1,353,665	\$1,647,940	\$1,942,215	\$2,236,490	\$2,530,765	\$2,648,475
	Annual Average Cost per 1,000 acres managed	\$0	\$10,702	\$14,269	\$13,442	\$13,959	\$14,269	\$14,476	\$14,623	\$14,734	\$14,820	\$15,509

**Table G-6g: Natural communities biological monitoring (field data collection contractors)**

**(For all acres managed. Monitoring on restored acres calculated in G-4). Reserve monitoring total above deducts cost allocated to restored lands.)**

		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Natural Communities	Annual cost based on person-hours per year for complete reserve system											
Grassland	\$28,679	\$0	\$10,994	\$29,316	\$41,425	\$57,358	\$73,290	\$89,223	\$105,156	\$121,088	\$137,021	\$143,394
Chaparral & Northern Coastal Scrub	\$1,424	\$0	\$546	\$1,456	\$2,057	\$2,848	\$3,639	\$4,431	\$5,222	\$6,013	\$6,804	\$7,120
Oak Woodland	\$4,277	\$0	\$1,640	\$4,372	\$6,178	\$8,554	\$10,931	\$13,307	\$15,683	\$18,059	\$20,436	\$21,386
Riparian Forest and Scrub	\$15,924	\$0	\$6,104	\$16,278	\$23,002	\$31,849	\$40,696	\$49,543	\$58,390	\$67,237	\$76,084	\$79,622
Conifer Woodland	\$370	\$0	\$142	\$378	\$534	\$740	\$945	\$1,150	\$1,356	\$1,561	\$1,767	\$1,849
Wetland	\$54,036	\$0	\$20,714	\$55,237	\$78,052	\$108,072	\$138,092	\$168,112	\$198,132	\$228,152	\$258,172	\$270,180
Open Water (aquatic)	\$3,000	\$0	\$1,150	\$3,066	\$4,333	\$5,999	\$7,666	\$9,332	\$10,998	\$12,665	\$14,331	\$14,998
	Cost per period	\$0	\$41,289	\$110,103	\$155,581	\$215,420	\$275,259	\$335,097	\$394,936	\$454,775	\$514,614	\$538,549
	Annual Average Cost per 1,000 acres managed	\$0	\$2,176	\$2,901	\$2,733	\$2,838	\$2,901	\$2,943	\$2,974	\$2,996	\$3,014	\$3,154

Assumptions / Notes:

159	Total covered plant occurrences protected, including the occurrences on existing open space, number protected by the Plan and the number created
5	Hours of covered plant surveying per occurrence per year
\$0	Annual cost to monitor Townsend's bat maternity colonies
2.2%	Percent of each species and/or land cover added each year beginning in year 1, assuming 45-year acquisition period.
15%	Percent premium on costs in years 1 - 10 to reflect more intensive early efforts and the fact that monitoring would become more efficient over time.
\$127	Contractor cost per hour including amortized per diem and travel
5	years per period



# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-6: Monitoring, Research, and Scientific Review  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-6h: California Tiger Salamander: Management plan, baseline genetic study, and on-going genetic monitoring for hybridization**

The objective of the management plan and baseline genetic study is to determine the percent of non-native genes in occupied sites (ponds/wetlands) and develop a management plan based on the data.

The objectives of the on-going monitoring are to inform the adaptive management process associated with the Management Plan, evaluate effectiveness of management/restoration,

and inform decision-making regarding CTS habitat restoration/acquisition.

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Baseline study and monitoring	-	\$175,220	\$337,260	\$518,220	-	-	-	-	-	-	-
On-going management monitoring	-	-	-	-	\$146,215	\$171,649	\$197,083	\$218,278	\$235,234	\$252,190	\$260,668
Cost per year	\$0	\$35,044	\$67,452	\$103,644	\$29,243	\$34,330	\$39,417	\$43,656	\$47,047	\$50,438	\$52,134
Cost per period	\$0	\$175,220	\$337,260	\$518,220	\$146,215	\$171,649	\$197,083	\$218,278	\$235,234	\$252,190	\$260,668

Assumptions / Notes: **215** total acres of CTS breeding habitat monitored by year 45, includes acquired reserve land and existing open space (Table 5-17)

Reserve system commitment by time period (Table 5-14)	Year 15	Year 30	Year 45
	30%	70%	100%
CTS potential breeding habitat (acres) by time period, cumulative	65	151	215

Baseline study data collection will occur during the first 15 years of plan implementation due to the relatively low number of ponds/wetlands within the Reserve System at the onset of the permit.

Breeding habitat is added relatively evenly over time, and hybridization is only monitored within Reserve System lands.

If a habitat is occupied, genetic samples will be collected and that habitat will be sampled again every three years.

Three years of sampling are required to determine habitat as unoccupied.

Two people (Project Leader/Permitted Specialist and Senior Field Crew) are required for each potential breeding habitat site visit.

A field season includes time for the following activities: personnel management, project planning, data collection, data entry and management, and report writing.

5	Average annual acres of potential breeding habitat added for the first 15 years of the permit term
6	Average annual acres of potential breeding habitat added years 16 - 30 of the permit term
4	Average annual acres of potential breeding habitat added years 30 - 45 of the permit term
30%	Percent of potential breeding habitat that is occupied habitat and therefore re-visited every three years for tissue collection purposes
20	Number of samples collected per occupied site
2	Number of pond/wetland sites visited per day, first 5 years
2.5	Number of sites visited per day, beginning in year 6
5	Days per year for project-related duties for Project Leader and for Senior Field Crew
\$140	Project Leader / Permitted Specialist, hourly rate
\$100	Senior Field Crew, hourly rate
\$150	Cost per sample for genetic testing, lab component
\$3,500	Annual cost for genetic testing: analysis and method design

Baseline Study and Monitoring Costs for equipment, labor, and testing, Years 1 - 15	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Acres of potential breeding habitat added each year	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Occupied habitat (acres), cumulative	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23
Unoccupied habitat (acres), cumulative	3	7	10	14	17	21	24	28	31	35	38	42	45	49	52
Unoccupied habitat (acres) that requires sampling	3	7	10	11	10	11	13	18	20	22	20	22	23	29	30
Occupied habitat (acres) that requires sampling	2	1	4	4	5	8	7	10	12	10	17	13	17	21	15
Samples collected	40	20	80	80	100	160	140	200	240	200	340	260	340	420	300
Field season days per person, including project-related duties	8	9	12	13	13	15	15	19	21	21	24	23	25	30	28

	1-5	6-10	11-15
Collection equipment	\$3,500	\$2,500	\$2,500
Tissue sampling equipment	\$3,500	\$2,500	\$2,500
Project Leader/Permitted Specialist (8 hours per day)	\$59,920	\$101,360	\$143,920
Senior Field Crew (8 hours per day)	\$42,800	\$72,400	\$102,800
Genetic testing: lab component	\$48,000	\$141,000	\$249,000
Genetic testing: analysis and method design	\$17,500	\$17,500	\$17,500
Cost per period	\$175,220	\$337,260	\$518,220

(waders, nets, dip nets, buckets, etc.)  
(collection jars, clippers, labels, notebooks, etc.)

Management Plan Monitoring, Years 16 - 50	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Occupied habitat (acres) added, every 5 years	9	9	9	6	6	6	-
Occupied habitat (acres), cumulative at end of period	32	41	50	56	62	68	68
Average acres of occupied habitat per period	28	37	46	53	59	65	68
Average number of occupied sites visited per year	4	5	7	8	9	10	10
Samples collected, average annual by period	83	110	137	159	177	195	204
Field season days, annual average per period, including project-related duties	7	7	8	8	9	9	9

	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Collection equipment	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
Tissue sampling equipment	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
Project Leader/Permitted Specialist (8 hours per day)	\$37,240	\$40,264	\$43,288	\$45,808	\$47,824	\$49,840	\$50,848
Senior Field Crew (8 hours per day)	\$26,600	\$28,760	\$30,920	\$32,720	\$34,160	\$35,600	\$36,320
Genetic testing: lab component	\$61,875	\$82,125	\$102,375	\$119,250	\$132,750	\$146,250	\$153,000
Genetic testing: analysis and method design	\$17,500	\$17,500	\$17,500	\$17,500	\$17,500	\$17,500	\$17,500
Cost per period	\$146,215	\$171,649	\$197,083	\$218,278	\$235,234	\$252,190	\$260,668

15%	Percent of all occupied sites visited annually.
\$300	Annual cost for collection equipment (waders, nets, dip nets, buckets, etc.)
\$300	Annual cost for tissue sampling equipment (collection jars, clippers, labels, notebooks, etc.)

Assumptions:  
New potential breeding habitat acreage will continue to be added to the Reserve, so baseline monitoring will continue to determine occupancy and percent non-native gene frequencies.  
Ponds/wetlands will be acquired/restored as part of the Conservation Plan, adding additional monitoring needs.  
Representative ponds/wetlands will continue to be monitored at about the same frequency as with the hybridization/population monitoring.  
All occupied sites will be visited and sampled on a regular basis, as stipulated by the Management Plan. For the purpose of this model, it is assumed occupied sites will be revisited every 5 years.

0.32

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-6: Monitoring, Research, and Scientific Review**

**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-6i: Monitoring Enhancement on Existing Open Space (County Parks and Open Space Authority land)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Cost per period for County Parks	\$0	\$142,451	\$316,558	\$298,206	\$309,676	\$316,558	\$321,145	\$324,422	\$326,880	\$328,792	\$344,084
Cost per period for Open Space Authority lands	\$0	\$11,590	\$25,755	\$24,262	\$25,195	\$25,755	\$26,129	\$26,395	\$26,595	\$26,751	\$27,995

Assumptions / Notes:

12,291	acres of existing County Parks managed for the Habitat Plan
1,000	acres of existing Open Space Authority lands managed for the Habitat Plan
30%	percent of monitoring cost per acre required for monitoring enhancement of existing open space
Monitoring activities begin in year 3	

**Table G-6j: Directed Research**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Average cost per year to fund directed research	\$0	\$185,500	\$79,500	\$53,000	\$21,200	\$21,200	\$0	\$0	\$0	\$0	\$0
Cost per period	\$0	\$927,500	\$397,500	\$265,000	\$106,000	\$106,000	\$0	\$0	\$0	\$0	\$0

Assumptions / Notes:

\$530,000	Directed research in Period 1-5 to investigate the feasibility of improving wildlife movement (Metcalf Canyon and Coyote Crk to Tulare Hill; Pajaro River between Santa Cruz Mts and Diablo Range; across Hwy 152 along Pacheco Creek.
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**Table G-6k: Scientific Review**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Average Independent Conservation Assessment Team cost per 5-year period	\$0	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500	\$26,500
Average Science Advisors cost per 5-year period	\$0	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840	\$67,840
Cost per period	\$0	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340	\$94,340

Assumptions / Notes:

Adaptive management experiments are covered under the monitoring staff and directed research categories.

The Independent Conservation Assessment Team will meet once every 4 years and have:

5	Members of Independent Conservation Assessment Team
\$5,300	Stipend per member per 5-year period

The Science Advisors will consist of:

8	Members of Science Advisors panel
\$8,480	Stipend per member per 5-year period

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-7: Western Burrowing Owl Conservation Strategy  
Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total
<b>Capital Budget</b>												
Tractor equipment costs	\$0	\$7,200	\$7,200	\$0	\$7,200	\$7,200	\$0	\$7,200	\$7,200	\$0	\$7,200	\$50,400
Other management equipment / burrows	\$0	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$50,000
<b>Capital Subtotal</b>	<b>\$0</b>	<b>\$12,200</b>	<b>\$12,200</b>	<b>\$5,000</b>	<b>\$12,200</b>	<b>\$12,200</b>	<b>\$5,000</b>	<b>\$12,200</b>	<b>\$12,200</b>	<b>\$5,000</b>	<b>\$12,200</b>	<b>\$100,400</b>
<b>Operational Budget</b>												
Grazing on managed acres	\$0	\$159,000	\$159,000	\$318,000	\$318,000	\$477,000	\$477,000	\$636,000	\$636,000	\$795,000	\$795,000	\$4,770,000
Tractor equipment maintenance cost	\$0	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$5,040
Hand tools replacement cost	\$0	\$1,260	\$1,260	\$1,260	\$2,520	\$1,260	\$1,260	\$1,260	\$2,520	\$1,260	\$1,260	\$15,120
Targeted studies	\$0	\$46,080	\$146,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$560,800
Monitoring	\$0	\$97,280	\$130,560	\$156,160	\$122,880	\$181,760	\$181,760	\$174,080	\$207,360	\$199,680	\$232,960	\$1,684,480
Optional tasks	\$0	\$0	\$250,000	\$54,240	\$304,240	\$54,240	\$304,240	\$54,240	\$304,240	\$54,240	\$54,240	\$1,433,920
<b>Operational Subtotal</b>	<b>\$0</b>	<b>\$304,124</b>	<b>\$687,404</b>	<b>\$576,244</b>	<b>\$794,224</b>	<b>\$760,844</b>	<b>\$1,010,844</b>	<b>\$912,164</b>	<b>\$1,196,704</b>	<b>\$1,096,764</b>	<b>\$1,130,044</b>	<b>\$8,469,360</b>
<b>Total</b>	<b>\$0</b>	<b>\$316,324</b>	<b>\$699,604</b>	<b>\$581,244</b>	<b>\$806,424</b>	<b>\$773,044</b>	<b>\$1,015,844</b>	<b>\$924,364</b>	<b>\$1,208,904</b>	<b>\$1,101,764</b>	<b>\$1,142,244</b>	<b>\$8,569,760</b>

**Table G-7a: Grazing on managed land**

Cost to allow grazing to manage potential burrowing owl habitat.

Acres managed by grazing	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Baylands Region	-	222	222	444	444	666	666	888	888	1,110	1,110
Gilroy Region	-	48	48	96	96	144	144	192	192	240	240
Morgan Hill Region	-	32	32	64	64	95	95	127	127	159	159
South San José Region	-	16	16	32	32	49	49	65	65	81	81
Cost per year	\$0	\$31,800	\$31,800	\$63,600	\$63,600	\$95,400	\$95,400	\$127,200	\$127,200	\$159,000	\$159,000
Cost per period	\$0	\$159,000	\$159,000	\$318,000	\$318,000	\$477,000	\$477,000	\$636,000	\$636,000	\$795,000	\$795,000

Assumptions/Notes:

Only 600 acres of occupied burrowing owl habitat will be acquired in fee title or conservation easement; these 600 acres are consistent with the reserve system and will be acquired consistent with impacts.

Due to the cost of acquisition and because owl nesting habitat does not overlap with many other covered species, 4,700 acres of managed lands are not expected to be the same as lands acquired for the Plan,

The Implementing Entity will partner with County Parks, OSA, TNC, or other organization protecting lands on the Valley floor.

The management agreements would be at least 10 years long and as such, managed lands would increase incrementally every 10 years.

That costs would be consistent for 10 year periods, and they should be accounted for at the beginning of the 10-year period.

The acreage of managed lands will never drop, and the acreage of managed lands will increase incrementally over time.

\$100	Dollars per acre annual cost for grazing, including fencing and access control	
30%	Percent of lands managed by grazing	
	Total acres managed (grazed) at end of permit term	Total land management commitment
Location		
Baylands Region	3,700	70%
Gilroy Region	800	15%
Morgan Hill Region	530	10%
South San José Region	270	5%
<b>Total acres</b>	<b>5,300</b>	<b>100%</b>

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-7: Western Burrowing Owl Conservation Strategy**

**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

**Table G-7b: Equipment and Tools Cost, Capital, Operations, and Annual Maintenance**

Equipment required for habitat enhancement; cost may be shared with VHP-wide costs

Tractor is accounted for under leased vehicles/equipment in Table G-5g

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Tractor mower, blade, and trailer purchased		x	x		x	x		x	x		x
Tractor equipment cost per period	\$0	\$7,200	\$7,200	\$0	\$7,200	\$7,200	\$0	\$7,200	\$7,200	\$0	\$7,200
Tractor equipment maintenance cost per period	\$0	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504	\$504
Number of sets of hand tools purchased	-	1	1	1	2	1	1	1	2	1	1
Hand tool cost per period	\$0	\$1,260	\$1,260	\$1,260	\$2,520	\$1,260	\$1,260	\$1,260	\$2,520	\$1,260	\$1,260
Other equipment cost per period	\$0	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500
Artificial burrow equipment cost per period	\$0	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500
Cost per period	\$0	\$6,260	\$6,260	\$6,260	\$7,520	\$6,260	\$6,260	\$6,260	\$7,520	\$6,260	\$6,260

**Assumptions/Notes:**

8	Year replacement rate for tractor trailer, blade, and mower (every X years)
\$3,500	Cost for mower, rear mounted for tractor
\$3,000	Cost for tractor blade
\$700	Cost for tractor trailer
10%	Annual maintenance cost as percent of average annual tractor equipment capital cost
4	Hand tool replacement cycle (every X years)
\$1,260	Cost per replacement cycle for hand tools (i.e., shovels, pulaskis, etc.)
\$500	Other equipment (field tools, compressors, etc.), annual cost
\$500	Artificial burrow equipment, flat rate annual cost

**Table G-7c: Targeted Studies - Baylands Region**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Prioritization of Burrowing Owl Conservation Areas (studies conducted annually)	-	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480	\$20,480
Review of regionwide standard protocols and reporting requirements (conducted annually)	-	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600	\$25,600
Population augmentation pilot study	-	-	\$100,000	-	-	-	-	-	-	-	-
Cost per period	\$0	\$46,080	\$146,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080	\$46,080

**Assumptions/Notes:**

Targeted studies will be contracted out. Cost includes report preparation.

\$128	Contractor cost per hour, including travel and per diem
32	Contractor hours per year for study to prioritize burrowing owl conservation areas
40	Contractor hours per year for annual review of regionwide standard protocols and reporting requirements
\$100,000	Cost to undertake Population Augmentation Pilot Study, occurs in years 6 - 10.

**Table G-7d: Monitoring of Western Burrowing Owl Compensation Sites (reserve system or other managed lands)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Hours per year, by period, to monitor burrowing owl compensation sites	-	100	100	140	140	180	180	220	220	260	260
Monitoring cost per period	\$0	\$64,000	\$64,000	\$89,600	\$89,600	\$115,200	\$115,200	\$140,800	\$140,800	\$166,400	\$166,400
Nesting and overwintering population surveys, conducted every three years: surveys per period	-	1	2	2	1	2	2	1	2	1	2
Survey cost per period	\$0	\$33,280	\$66,560	\$66,560	\$33,280	\$66,560	\$66,560	\$33,280	\$66,560	\$33,280	\$66,560
Cost per period	\$0	\$97,280	\$130,560	\$156,160	\$122,880	\$181,760	\$181,760	\$174,080	\$207,360	\$199,680	\$232,960

**Assumptions/Notes:**

This is direct burrowing owl monitoring that would occur in addition to other planned reserve monitoring.

\$128	Contractor cost per hour for monitoring and surveys, including travel and per diem
260	Contractor hours per survey for nesting and overwintering population surveys
3	Survey frequency (every X years, beginning in first three years)

**Table G-7e: Optional Tasks (Operational)**

	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Population viability analysis update	-	-	-	\$10,240	\$10,240	\$10,240	\$10,240	\$10,240	\$10,240	\$10,240	\$10,240
Feral cat removal program	-	-	-	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000
Population augmentation program	-	-	\$150,000	-	\$150,000	-	\$150,000	-	\$150,000	-	-
Additional studies	-	-	\$100,000	-	\$100,000	-	\$100,000	-	\$100,000	-	-
Cost per period	\$0	\$0	\$250,000	\$54,240	\$304,240	\$54,240	\$304,240	\$54,240	\$304,240	\$54,240	\$54,240

**Assumptions/Notes:**

\$128	Contractor cost per hour
80	Contractor hours per period to update population viability analysis, begins in year 11
88	Labor hours per year for feral cat removal program, begins in year 11
\$100	Hourly rate for labor in feral cat removal program
\$150,000	Cost of population augmentation program, once every 10 years, years 10, 20, 30, and 40
\$100,000	Cost for series of additional studies (e.g., genetics, overwintering habitat, management effectiveness) undertaken every 10 years, years 10, 20, 30, and 40

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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-8: Contingency Fund (not including restoration contingency)**

**Final Plan**

**2010 dollars**

Detail may not add to total due to rounding at various stages of the calculations.

	Implementation Period (Years)											Total
	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
All other program budget items	\$149,750	\$7,348,373	\$12,650,488	\$13,305,893	\$14,543,579	\$14,749,902	\$16,088,917	\$16,200,564	\$16,665,427	\$17,361,311	\$16,080,390	\$145,144,596
General Operating Contingency	\$4,492	\$220,451	\$379,515	\$399,177	\$436,307	\$442,497	\$482,668	\$486,017	\$499,963	\$520,839	\$482,412	\$4,354,338
Other Contingency												
Land acquisition and site improvements	\$108,000	\$789,502	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$896,389	\$886,665	\$0	\$8,058,893
<b>Total Contingency</b>	<b>\$112,492</b>	<b>\$1,009,954</b>	<b>\$1,275,904</b>	<b>\$1,295,566</b>	<b>\$1,332,697</b>	<b>\$1,338,886</b>	<b>\$1,379,057</b>	<b>\$1,382,406</b>	<b>\$1,396,352</b>	<b>\$1,407,504</b>	<b>\$482,412</b>	<b>\$12,413,231</b>

**Assumptions / Notes:**

3%	Percent of total program funding, exclusive of acquisition capital budget and restoration budget, needed for contingency fund.
3%	Contingency factor for land acquisition (applied to land acquisition capital costs, including site improvements).

# Santa Clara Valley Habitat Plan Implementation Budget

## Assumptions for costs in perpetuity

Table G-9: Master list of assumptions used to develop Habitat Plan budget

### Assumptions for annual budget beyond permit term

#### Staffing/Personnel Costs

##### Salaries and Benefits, Travel

Salary per employee per year	Benefit multiplier (percent of salary)		Days of overnight travel per FTE per year	Mileage allowance per year per FTE (miles)	Number of FTEs Post Permit	Number of FTEs Years 46-50
\$127,200	35%	Administrative Director	5	-	1.0	1.0
\$76,320	35%	IT - Database / GIS Management	-	-	0.0	0.0
\$74,200	35%	Budget Analyst	-	-	0.0	0.5
\$90,100	35%	Grant Specialist	-	500	0.0	0.5
\$93,600	35%	Public Education & Outreach	-	1,000	0.0	0.5
\$53,000	35%	Administrative Assistant	-	250	0.5	1.0
\$100,700	35%	Senior Scientist	3	-	0.5	0.5
\$90,100	35%	Project Manager/Conservation Planner	1	-	0.0	1.0
\$90,100	35%	Reserve Manager	-	-	0.5	0.5
\$68,900	35%	Field Staff	-	-	2.0	5.0
\$53,000	35%	Laborer	-	-	0.0	0.0
Total					4.50	10.50
Annual Average turnover staff beyond permit term: assumes full turnover every 2.5 years					1.80	
Old Staff Remaining					2.70	

50%	Admin-Secretary time allocated to program administration
50%	Admin-Secretary time allocated to reserve management
\$186	Travel allowance per diem
3.00	Per diem multiplier for executive director to cover additional travel expenses such as airfare
\$0.514	Cost per mile for travel allowance
50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
<b>Overhead cost allocation</b>	
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to restoration
20%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to monitoring and research

#### Equipment and Vehicles

##### Office Equipment per employee

Annualized Cost per FTE per replacement period	Cost of service contract per year	Equipment type	Adjusted Replacement Period (years)
\$53		Common office furniture	40
\$53		Cubicle furniture	40
\$265		Office supplies (annual)	2
\$442	\$44	Computers	6
\$159	\$32	Cell phones	4
\$159	\$106	Mobile radios	6
2		unit of common office furniture purchased each replacement period	
1		Mobile radio per vehicle	
2		Post-permit adjustment for replacement period (multiple for replacement period)	

##### General Office Equipment

Cost per year (leased items) / Annualized cost per item per replacement period (purchased items)	Cost of service contract per item per year	Type of Equipment
\$1,144	\$0	Color printer/copy machine/scanner (lease)
\$6,240	\$0	Office telephone systems (lease)
\$1,560		Books and journals (purchase)
\$26		New fax machines purchased
		Old fax machines retired
	\$0	Total fax machines
\$146		New printers purchased
		Old printers retired
	\$0	Total printers
\$84		New digital cameras purchased
		Old digital cameras retired
	\$0	Total digital cameras
\$130		Radio base station purchased
		Radio base station retired
	\$104	Total radio base stations
\$6,230		Trunked radio system (shared tower and repeaters)
Assumes printer and phone maintenance/service contracts provided at no cost by Permittees.		
10		year replacement period for fax machine and printer.
6		year replacement period for digital cameras.
20		year replacement period for radio base station.
2		Post-permit adjustment for replacement period (multiple for replacement period)

# Santa Clara Valley Habitat Plan Implementation Budget

## Assumptions for costs in perpetuity

**Table G-9: Master list of assumptions used to develop Habitat Plan budget**  
**Assumptions for annual budget beyond permit term**

### Technology Equipment and Services

Annualized Cost per item per replacement period	Cost of software update or service contract per year	Type of Equipment
\$0		New GIS/database servers purchased
		Old GIS/database servers retired
	\$0	Total GIS/database servers
\$520		New tablet PC purchased
		Old tablet PCs retired
	\$52	Total tablet PCs
\$1,092		New plotters purchased
		Old plotters retired
	\$83	Total plotters
\$416		New GPS units purchased
		Old GPS units retired
	\$146	Total GPS units
\$0		New GIS software purchased
		Old GIS software retired
	\$0	Total GIS software
\$520		New computer software purchased
		Old computer software retired
	\$121	Total computer software
\$21,200	annual cost of contract GIS services, years 26 - 50	
10	year replacement period for GIS and database equipment purchased.	
6	year software upgrade cycle	
2	Post-permit adjustment for replacement period (multiple for replacement period)	

### Vehicles and Fuel

Annualized purchase price per vehicle per replacement period	Fuel cost per vehicle per year		Maintenance cost per vehicle per year	Annual Average Vehicles Post Permit	Number of Vehicles Years 46-50
\$1,061	\$1,560	Passenger cars	\$1,248	1	1
\$3,120	\$2,080	4WD trucks	\$2,080	2	2
\$832	\$416	ATVs and trailers	\$520	1	1
		Total vehicles		4	
20	year replacement period for passenger vehicle				
10	year replacement period for 4WD truck				
10	year replacement period for ATV				
2	Post-permit adjustment for replacement period (multiple for replacement period)				

### Leased Vehicle/Equipment

\$47,280	Annual average lease cost in year 50
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

### Other Program Administration

#### Office Space

Assumes Implementing Entity will share office space with existing agencies.

2,000	Total space leased per period (square feet)
\$2.12	Cost per square foot per month
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

#### Utility Costs

Utility costs included in office lease costs, above.

\$0.00	Annual cost per sq. ft. of office space
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#### Insurance

\$1,855	Automobile insurance cost per year per vehicle
\$5,830	Directors' and officers' insurance cost per year
\$5,830	General liability insurance cost per year
\$5,745	Professional liability insurance cost per year
100%	Post-permit adjustment for auto, general liability, and professional liability insurance: percentage of annual costs in year 50 that continue in perpetuity
0%	Post-permit adjustment for directors' and officers' insurance: percentage of annual costs in year 50 that continue in perpetuity

#### Staff Training

\$318	Annual cost of training per staff member (excluding travel)
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

#### Uniforms

\$0	Annual cost for t-shirts and polos for all employees
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

#### Law Enforcement /Public Safety Costs

Law enforcement costs on existing open space will be covered by County Parks through County Parks Rangers and the County Sheriff.

\$8.48	Law enforcement /public safety cost per reserve acre per year
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

#### Public Education/Outreach

\$53,000	Annual cost after start-up
50%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

# Santa Clara Valley Habitat Plan Implementation Budget

## Assumptions for costs in perpetuity

**Table G-9: Master list of assumptions used to develop Habitat Plan budget**

**Assumptions for annual budget beyond permit term**

### Management and Maintenance

	All Reserve Lands	Restored Wetlands	Annual Costs Year 46 - 50
Capital Budget	Annual Costs Post Permit	Annual Costs Post Permit	
Furniture and equipment purchase	\$742	\$0	\$4,908
Vehicle purchase (annualized)	\$7,238	\$0	\$20,776
Other equipment purchase	\$108,607	\$0	\$108,607
Field facilities / plant nursery - construction cost	\$0	\$0	\$0
Wells and water pumping equipment	\$0	\$0	\$0
Contractors - capital	\$0	\$0	\$66,860
Remedial measures	\$0	\$0	\$178,836
<b>Capital Subtotal</b>	<b>\$116,587</b>	<b>\$0</b>	<b>\$379,986</b>
Operational Budget			
Reserve staff	\$167,606	\$0	\$325,731
Overnight travel	\$49	\$0	\$162
Vehicle mileage allowance	\$0	\$0	\$0
Office equipment maintenance and supplies	\$395	\$0	\$4,826
Vehicle fuel and maintenance	\$10,426	\$0	\$10,526
Vehicle/equipment rental	\$47,280	\$0	\$47,280
Other equipment and materials - operational	\$58,303	\$0	\$58,303
Field facilities maintenance and utilities	\$39,750	\$0	\$39,750
Establish permanent seed bank	\$0	\$0	\$0
Water pumping	\$4,770	\$0	\$4,770
Invasive species control	\$227,130	\$13,577	\$240,707
Existing open space, County Parks & OSA land	\$877,468	\$0	\$877,468
Reserve management planning	\$10,600	\$0	\$21,200
Other Contractors - operational	\$161,647	\$22,896	\$195,143
Environmental compliance	\$0	\$0	\$0
<b>Operational Subtotal</b>	<b>\$1,605,424</b>	<b>\$36,473</b>	<b>\$1,825,867</b>
<b>Total</b>	<b>\$1,722,011</b>	<b>\$36,473</b>	<b>\$2,205,853</b>
0%	Post-permit adjustment: percentage of annual costs for field facilities, wells, environmental compliance and other capital construction services in year 50 that continue in per		
50%	Post-permit adjustment: percentage of annual costs for reserve planning in year 50 that continue in perpetuity		
100%	Post-permit adjustment: percentage of annual costs for all other reserve management costs in year 50 that continue in perpetuity		

### Western Burrowing Owl

	Annual Costs Post Permit	Annual Costs Year 46 - 50
Capital Budget		
Tractor equipment costs	\$1,440	\$1,440
Other management equipment/burrows	\$1,000	\$1,000
<b>Capital Subtotal</b>	<b>\$2,440</b>	<b>\$2,440</b>
Operational Budget		
Grazing on managed acres	\$159,000	\$159,000
Tractor equipment maintenance cost	\$101	\$101
Hand tools replacement cost	\$252	\$252
Targeted studies	\$9,216	\$9,216
Monitoring	\$46,592	\$46,592
Optional tasks	\$10,848	\$10,848
<b>Operational Subtotal</b>	<b>\$226,009</b>	<b>\$226,009</b>
<b>Total</b>		
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity	

### Monitoring

	Annual Costs Post Permit	Annual Costs Year 46 - 50
Capital Budget		
Shared vehicles and equipment	\$636	\$1,682
Operational Budget		
Shared staff and overhead	\$40,027	\$133,424
Monitoring plan	\$0	\$0
Biological monitoring contractors	\$164,501	\$548,336
California Tiger Salamander monitoring	\$52,134	\$52,134
Monitoring of existing open space reserves	\$22,325	\$74,416
Directed research	\$0	\$0
Scientific review	\$0	\$18,868
<b>Operational Subtotal</b>	<b>\$278,986</b>	<b>\$827,177</b>
<b>Total</b>	<b>\$279,622</b>	<b>\$828,859</b>
30%	Percentage of annual monitoring costs for labor in year 50 that continue post permit (source: Paula Bernazanni, 1/31/2008 email)	
30%	Percentage of annual monitoring costs for equipment in year 50 that continue post permit (source: Paula Bernazanni, 1/31/2008 email)	
100%	Post-permit adjustment: percentage of annual costs for California Tiger Salamander monitoring in year 50 that continue in perpetuity	

### Monitoring on Restored Wetlands

	Annual Costs Post Permit	Annual Costs Year 46 - 50
Operational Budget		
Biological monitoring contractors	\$26,721	\$89,069
30%	Percentage of annual monitoring costs for labor in year 50 that continue post permit (source: Paula Bernazanni, 1/31/2008 email)	



# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9a: Program Administration Beyond the Permit Term  
Final Plan**

2010 dollars	
	Annual Cost Beyond Permit Term
<b>Capital Budget</b>	
Office furniture & equipment by employee	\$1,095
General office equipment	\$8,186
Technology equipment	\$2,548
Vehicle purchase (annualized)	\$106
<b>Capital Subtotal</b>	<b>\$11,935</b>
<b>Operational Budget</b>	
Employees	\$215,008
Office space lease and utilities	\$50,880
Office equipment maintenance & supplies	\$539
Maintenance of general office equipment	\$13,728
Maintenance of technology equipment	\$402
GIS services (contract)	\$21,200
Vehicle fuel and maintenance	\$281
Travel	\$1,405
Vehicle / mileage allowance	\$16
Insurance	\$18,471
Staff training and uniforms	\$1,431
Law enforcement / public safety	\$289,617
Public relations and outreach	\$26,500
<b>Operational Subtotal</b>	<b>\$639,478</b>
<b>Total</b>	<b>\$651,413</b>

## Employee Costs (including shared staff costs)

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per FTE per year	Number of FTEs post permit	Number of FTEs Years
Administrative Director	\$127,200	35%	\$171,720	1.00	1.00
IT - Database / GIS Management	\$76,320	35%	\$103,032	0.00	0.00
Budget Analyst	\$74,200	35%	\$100,170	0.00	0.50
Grant Specialist	\$90,100	35%	\$121,635	0.00	0.50
Public Education & Outreach	\$63,600	35%	\$85,860	0.00	0.50
Administrative Assistant	\$53,000	35%	\$71,550	0.25	0.50
Total FTEs				1.25	3.00
Employee cost per year				\$189,608	\$318,398
Shared staff cost per year				\$25,400	\$65,468
Employee cost per year				\$215,008	\$383,866

### Assumptions / Notes:

The position of senior scientist is included in shared staff and overhead.

JPA employee costs are not included in the program administration cost category.

Admin - Secretary time is allocated 50% to program administration and 50% to reserve management.

10% Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

## Office Space

	Annual Cost beyond Permit Term
<b>\$2.12</b>	<b>2,000</b>
Lease cost per year	\$50,880

### Assumptions / Notes:

Assumes Implementing Entity will share office space with existing agencies.

## Utility Costs (for office space)

	Annual Cost beyond Permit Term
Utility cost per year	\$0

### Assumptions / Notes:

Utility costs included in office lease costs, above.

\$0.00 Annual cost per sq. ft. of office space

## Office Equipment and Supplies by Employee (including shared costs)

Equipment type	Annualized Cost per FTE per replacement period	Cost of service contract per year	Annual Average Beyond Permit Term
Total FTEs beyond permit term			
Common office furniture	\$53		1.3
Cubicle furniture	\$53		

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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9a: Program Administration Beyond the Permit Term  
Final Plan**

2010 dollars			
Office supplies (annual)	\$265		
Computers	\$442	\$44	
Cell phones	\$159	\$32	
Furniture and equipment (capital) cost per year			\$883
Shared furniture and equipment cost per year			\$212
Total furniture and equipment (capital) cost per year			\$1,095
Maintenance and supplies cost per year			\$426
Shared maintenance and supplies cost per year			\$113
Total maintenance and supplies cost per year			\$539

**Assumptions / Notes:**

2	unit of common office furniture purchased each replacement period
40	year replacement period for common office furniture
40	year replacement period for cubicle office furniture (per employee)
2	year replacement period for office supplies
6	year replacement period for computers
4	year replacement period for cell phones
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

**General Office Equipment**

Equipment type	Cost per year (leased items) / Annualized cost per item per replacement period (purchased items)	Cost of service contract per item per year
Color printer/copy machine/scanner (lease)	\$1,144	\$0
Office telephone systems (lease)	\$6,240	\$0
Books and journals (purchase)	\$1,560	
New fax machines purchased	\$26	
Old fax machines retired		
Total fax machines		\$0
New printers purchased	\$146	
Old printers retired		
Total printers		\$0
New digital cameras purchased	\$84	
Old digital cameras retired		
Total digital cameras		\$0
Radio base station purchased	\$130	
Radio base station retired		
Total radio base stations		\$104
Trunked radio system (shared tower and repeaters)	\$6,240	
Equipment purchase (capital) cost per year		\$8,186
Lease and maintenance (operating) cost per year		\$13,728

**Assumptions / Notes:**

Assumes printer and phone maintenance/service contracts provided at no cost by Permittees.	
10	year replacement period for fax machine and printer.
6	year replacement period for digital cameras.
20	year replacement period for radio base station.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9a: Program Administration Beyond the Permit Term  
Final Plan**

2010 dollars

## GIS and Database Equipment

Equipment type	Annualized Cost per item per replacement period	Cost of software update or service contract per year
New GIS/database servers purchased	\$0	
Old GIS/database servers retired		
Total GIS/database servers		\$0
New tablet PC purchased	\$520	
Old tablet PCs retired		
Total tablet PCs		\$52
New plotters purchased	\$1,092	
Old plotters retired		
Total plotters		\$83
New GPS units purchased	\$416	
Old GPS units retired		
Total GPS units		\$146
New GIS software purchased	\$0	
Old GIS software retired		
Total GIS software		\$0
New computer software purchased	\$520	
Old computer software retired		
Total computer software		\$121
Equipment purchase (capital) cost per year		\$2,548
Maintenance cost per year		\$402
GIS contract services per year		\$21,200

### Assumptions / Notes:

\$21,200	annual cost of contract GIS services, years 26 - 50
10	year replacement period for GIS and database equipment purchased.
6	year software upgrade cycle

## Passenger Vehicles and Fuel (shared with reserve management and monitoring)

	Annual Cost Beyond Permit Term
Passenger car purchase	\$106
Vehicle fuel and maintenance	\$281

### Assumptions / Notes:

10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration
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## Vehicle Mileage Allowance (including shared cost)

	Mileage allowance per year per FTE (miles)	Annual Vehicle Mileage Allowance beyond Permit Term
Administrative Director	-	\$0
IT - Database / GIS Management	-	\$0
Budget Analyst	-	\$0
Grant Specialist	250	\$0
Public Education & Outreach	500	\$0
Administrative Assistant	125	\$16
Mileage allowance cost per year		\$16
Shared mileage allowance cost per year		\$0
Mileage allowance cost per year		\$16

### Assumptions / Notes:

50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
\$0.514	Cost per mile for travel allowance
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9a: Program Administration Beyond the Permit Term  
Final Plan**

2010 dollars

## Overnight Travel (including shared cost)

	Days of overnight travel per FTE per year	Annual Overnight Travel beyond Permit Term
Administrative Director	2.5	\$1,391
IT - Database / GIS Management	-	\$0
Budget Analyst	-	\$0
Grant Specialist	-	\$0
Public Education & Outreach	-	\$0
Administrative Assistant	-	\$0
	Travel cost per year	\$1,391
	Shared travel cost per year	\$14
	Travel cost per year	\$1,405

## Assumptions / Notes:

50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
\$186	Travel allowance per diem
\$3	Per diem multiplier for executive director to cover additional travel expenses such as airfare
10%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to program administration

## Insurance

Insurance type	Cost per year per vehicle	Cost per year	Annual Beyond Permit Term
Total vehicles per year			2.10
Automobile	\$1,855		\$3,896
Directors and officers		\$0	\$0
Liability		\$5,830	\$5,830
Professional liability		\$8,745	\$8,745
	Insurance cost per year		\$18,471

100%	Post-permit adjustment for auto, general liability, and professional liability insurance: percentage of annual costs in year 50 that continue in perpetuity
0%	Post-permit adjustment for directors' and officers' insurance: percentage of annual costs in year 50 that continue in perpetuity

## Staff Training

	Annual cost of Training beyond Permit Term
Total Staff	4.50
Staff training cost per year	\$1,431

## Assumptions / Notes:

\$318	Annual cost of training per staff member (excluding travel)
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

## Staff Uniforms

	Annual cost of Uniforms beyond Permit Term
Total Staff	4.50
Annual cost of uniforms per staff	\$0
Uniform cost per year	\$0

## Assumptions / Notes:

\$0	Annual cost for t-shirts and polos for all employees
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

## Law Enforcement / Public Safety Costs

	Annual cost beyond Permit Term
Reserve acres managed (cumulative total)	34,153
Law enforcement /public safety cost per year	\$289,617

## Assumptions / Notes:

Law enforcement costs on existing open space will be covered by County Parks through County Parks Rangers and the County Sheriff.	
\$8.48	Law enforcement /public safety cost per reserve acre per year
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

## Public Education/Outreach

	Annual cost beyond Permit Term
Public education cost per year	\$26,500

\$53,000	Annual cost after start-up
50%	Percentage of annual costs that continue after year 50

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**Table G-9b: Shared staff and overhead (shared among management and monitoring) Beyond Permit Term Final Plan**

2010 dollars	
Capital budget	Annual Cost beyond Permit Term
Office furniture & equipment	\$2,120
Passenger car purchase (annualized)	\$1,061
<b>Capital subtotal</b>	<b>\$3,181</b>
Operational budget	
Staff	\$254,003
Equipment maintenance & supplies	\$1,129
Vehicle fuel and maintenance	\$2,808
Vehicle mileage allowance	\$0
Overnight travel	\$139
<b>Operational subtotal</b>	<b>\$258,079</b>
<b>Total</b>	<b>\$261,259</b>

**Staff (shared among administration, reserve management, and monitoring)**

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per employee per year	Number of FTEs post permit	Number of FTEs Years 46-50
Senior Scientist	\$100,700	35%	\$135,945	0.5	0.5
Project Manager/Conservation Planner	\$90,100	35%	\$121,635	0.0	1.0
Field Staff	\$68,900	35%	\$93,015	2.0	5.0
Total FTEs				2.5	6.5
Employee cost per year				\$254,003	\$654,683

**Office Equipment and Supplies (shared among administration, reserve management, and monitoring)**

Equipment type	Annualized Cost per FTE per replacement period	Cost of service contract per year	Annual Average Beyond Permit Term
Total FTEs per year Beyond Permit Term			3
Cubicle furniture	\$53		3
Office supplies (annual)	\$265		3
Computers	\$442	\$44	3
Cell phones	\$159	\$32	3
Mobile radios purchased	\$159		1
Total Mobile radios		\$106	1
Furniture and equipment (capital) cost per period			\$2,120
Maintenance and supplies cost per year			\$1,129

**Assumptions / Notes:**

40	year replacement period for cubicle office furniture (per employee)
2	year replacement period for office supplies
6	year replacement period for computers
4	year replacement period for cell phones
1	Mobile radio per vehicle

**Table G-9b: Shared staff and overhead (shared among management and monitoring) Beyond Permit Term Final Plan****2010 dollars****Passenger Vehicles and Fuel (shared among administration, reserve management, and monitoring)**

	Annualized Cost Beyond Permit Term
Passenger cars (number of cars)	1
Annualized purchase cost	\$1,061
Fuel and maintenance per year	\$2,808

**Assumptions / Notes:**

\$1,061	Passenger car purchase price (annualized over replacement period)
2	Post-permit adjustment for replacement period (multiple for replacement period)
\$1,560	Fuel cost per vehicle per year
\$1,248	Maintenance cost per vehicle per year

**Vehicle Mileage Allowance (shared among administration, reserve management, and monitoring)**

	Mileage allowance per year per FTE (miles)	Annual Vehicle Mileage Allowance beyond Permit Term
Senior Scientist	-	\$0
Project Manager/Conservation Planner	-	\$0
Field Staff	-	\$0
Mileage allowance cost per year		\$0

**Assumptions / Notes:**

50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
\$0.514	Cost per mile for travel allowance

**Overnight Travel (shared among administration, reserve management, and monitoring)**

	Days of overnight travel per FTE per year	Annual Overnight Travel beyond Permit Term
Senior Scientist	1.5	\$139
Project Manager/Conservation Planner	0.5	\$0
Field Staff	-	\$0
Travel cost per year		\$139

**Assumptions / Notes:**

50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
\$186	Travel allowance per diem

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9c: Reserve Management and Maintenance - Beyond Permit Term  
Final Plan**

**2010 dollars**

	Annual Cost Beyond Permit Term	Allocation to All Reserve Land	Allocation to Restored Wetlands
<b>Capital Budget</b>			
Furniture and equipment purchase	\$742	\$742	
Vehicle purchase (annualized)	\$7,238	\$7,238	
Other equipment purchase	\$108,607	\$108,607	
Field facilities / plant nursery - construction cost	\$0	\$0	
Wells and water pumping equipment	\$0	\$0	
Contractors - capital	\$0	\$0	
Remedial measures	\$0	\$0	
<b>Capital Subtotal</b>	<b>\$116,587</b>	<b>\$116,587</b>	<b>\$0</b>
<b>Operational Budget</b>			
Reserve staff	\$167,606	\$167,606	
Overnight travel	\$49	\$49	
Vehicle mileage allowance	\$0	\$0	
Office equipment maintenance and supplies	\$395	\$395	
Vehicle fuel and maintenance	\$10,426	\$10,426	
Vehicle/equipment rental	\$47,280	\$47,280	
Other equipment and materials - operational	\$58,303	\$58,303	
Field facilities maintenance and utilities	\$39,750	\$39,750	
Permanent seed bank	\$0	\$0	
Water pumping	\$4,770	\$4,770	
Invasive species control	\$240,707	\$227,130	\$13,577
Existing open space, County Parks and OSA land	\$877,468	\$877,468	
Contractors - operational	\$184,543	\$161,647	\$22,896
Environmental compliance	\$0	\$0	\$0
<b>Operational Subtotal</b>	<b>\$1,631,297</b>	<b>\$1,594,824</b>	<b>\$36,473</b>
<b>Total</b>	<b>\$1,747,884</b>	<b>\$1,711,411</b>	<b>\$36,473</b>

## Reserve Management Employee Costs (including shared staff costs)

Position	Salary per employee per year	Benefit multiplier (percent of salary)	Total cost per FTE per year	Number of FTEs post permit	Number of FTEs Years 46-50
Reserve Manager	\$90,100	35%	\$121,635	0.5	0.5
Laborer	\$53,000	35%	\$71,550	0.0	0.0
Administrative Assistant	\$53,000	35%	\$71,550	0.25	0.5
Total FTEs				0.75	1.0
Employee cost per year				\$78,705	\$96,593
Shared staff cost per year				\$88,901	\$229,139
Employee cost per year				\$167,606	\$325,731

Assumptions / Notes:

35% Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

Admin - Secretary time is allocated 50% to program administration and 50% to reserve management.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9c: Reserve Management and Maintenance - Beyond Permit Term  
Final Plan**

**2010 dollars**

**Office Equipment and Supplies by Employee (including shared costs)**

Equipment type	Annualized Cost per FTE per replacement period	Cost of service contract per year	Annual Average Beyond Permit Term
		Total FTEs	0.75
Cubicle furniture	\$53		-
Office supplies (annual)	\$265		-
Computers	\$442	\$44	-
Cell phones	\$159	\$32	-
Mobile radios purchased	\$954		-
Total mobile radios		\$106	-
Furniture and equipment purchase (capital) cost per year			\$0
Shared furniture and equipment (capital) cost per year			\$742
Total furniture and equipment purchase (capital) cost per year			\$742
Maintenance, supplies, radio system cost per year			\$0
Shared maintenance and supplies cost per year			\$395
Total maintenance and supplies cost per year			\$395

**Assumptions / Notes:**

40	year replacement period for cubicle office furniture (per employee)
2	year replacement period for office supplies
6	year replacement period for computers
4	year replacement period for cell phones
1	Mobile radio per vehicle
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

**Overnight Travel (including shared cost)**

Position	Days of overnight travel per FTE per year	Annual Overnight Travel beyond Permit Term
Reserve Manager	-	\$0
Administrative Assistant	-	\$0
Travel cost per year		\$0
Shared travel cost per year		\$49
Travel cost per year		\$49

**Assumptions / Notes:**

50%	Post-permit adjustment for overnight travel and mileage allowance (percent of annual amount during permit term)
\$186	Travel allowance per diem
35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management

Travel includes offsite travel. Travel in the course of HCP/NCCP reserve management is covered under the vehicles, maintenance, and fuel cost category below.

**Passenger Vehicles and Fuel (shared with administration, restoration, and monitoring)**

	Annual Average Beyond Permit Term
Passenger car purchase	\$371
Vehicle fuel and maintenance	\$983

**Assumptions / Notes:**

35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management
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# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9c: Reserve Management and Maintenance - Beyond Permit Term  
Final Plan**

**2010 dollars**

**Vehicle Mileage Allowance (shared with administration, restoration, and monitoring)**

	Annual Average Beyond Permit Term
Cost per year	\$0

Assumptions / Notes:

35%	Proportion of shared staff, equipment, vehicle, and travel costs allocated to management
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**Vehicles, Maintenance, and Fuel**

	Annualized Cost Beyond Permit Term
Number of 4WD trucks	2
Number of ATVs and trailers	1
Annualized purchase cost	\$7,238
Fuel and maintenance per year	\$9,443

Assumptions / Notes:

\$3,120	4WD truck purchase price (annualized over replacement period)
\$832	ATV and trailer truck purchase price (annualized over replacement period)
2	Post-permit adjustment for replacement period (multiple for replacement period)
\$2,080	4WD truck fuel cost per year
\$2,080	4WD truck maintenance cost per year
\$416	ATV and trailer fuel cost per year
\$520	ATV and trailer maintenance cost per year

**Leased Vehicles and Equipment**

	Annual Average Beyond Permit Term
Vehicle and equipment rental cost per year	\$47,280

Assumptions / Notes:

\$47,280	Annual average lease cost in year 50
100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

**Equipment, Materials, and Data**

	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50
Capital cost of equipment and materials per year	\$108,607	\$108,607
Operational cost of equipment, materials, and data per year	\$58,303	\$58,303

Assumptions / Notes:

100%	Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity
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Capital costs include the capital component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.

Operational costs include the operational component of fire fighting equipment/gear, small tools (pliers, wrenches, screwdrivers, etc.), glasses, gloves, hard hats, rain gear, irrigation supplies, cargo container, landscape plants and grass, oak trees, lumber, and truck hauling services.

Operational costs also include portable radios, small pumps, piping, generator, saw, and demolition hammers.

# Santa Clara Valley Habitat Plan Implementation Budget

**Table G-9c: Reserve Management and Maintenance - Beyond Permit Term  
Final Plan**

**2010 dollars**

## Facilities Maintenance and Utilities

	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50
Field facilities maintenance cost per year	\$31,800	\$31,800
Field facilities utilities cost per year	\$7,950	\$7,950
Native plant nursery operating cost per year	\$0	\$0
Cost per year	\$39,750	

Assumptions / Notes:

**100%** Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

## Wells and Water Pumping

	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50
Operational cost per year	\$4,770	\$4,770

Assumptions / Notes:

**100%** Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

## Invasive Species Control (allocated between restored wetlands and other reserve lands)

	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50	Allocation to All Other Reserve Land	Allocation to Restored Wetlands
Cost per year	\$240,707	\$240,707	\$227,130	\$13,577

Assumptions / Notes:

**100%** Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

Note: Bullfrog management activities will be conducted by reserve staff. All herbicides applied according to label instructions. Pesticides may be applied using aerial, truck, or hand application.

Note: Management activities for non-native fish will be done by reserve staff. Costs for management for non-native fish in ponds in existing open space covered in Table G-5m.

Management of existing open space (County Parks and Open Space Authority land)	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50
Cost per period	\$877,468	\$877,468

Assumptions / Notes:

**100%** Post-permit adjustment: percentage of annual costs in year 50 that continue in perpetuity

Management activities begin in year 6.

Does not include other costs such as recreation and law enforcement / public safety because those services are already provided by County Parks and the County Sheriff.

## Contractors - for on-going management and maintenance (pond maintenance services allocated between restored wetlands and other reserve lands)

Contractor category	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50	Allocation to All Other Reserve Land	Allocation to Restored Wetlands
Reserve unit management plans and updates	\$10,600	\$21,200	\$10,600	\$0
Pond maintenance	\$56,286	\$56,286	\$33,390	\$22,896
All other maintenance services	\$117,657	\$117,657	\$117,657	\$0
Cost per year	\$184,543	\$195,143	\$161,647	\$22,896

Assumptions / Notes:

**0%** Post-permit adjustment: percentage of annual costs for field facilities, wells, environmental compliance and other capital construction services in year 50 that continue in perpetuity

**50%** Post-permit adjustment: percentage of annual costs for reserve planning in year 50 that continue in perpetuity

**100%** Post-permit adjustment: percentage of annual costs for all other reserve management costs in year 50 that continue in perpetuity

Other maintenance services include pond and dirt road maintenance, weed management, mowing, grading, pest control, diskling for fire breaks, fencing, alarms, janitorial services, removing debris associated with illegal marijuana cultivation.

Environmental Compliance for Reserve Management Projects	Annual Average Cost Beyond Permit Term	Annual Cost Years 46- 50	Allocation to All Other Reserve Land	Allocation to Restored Wetlands
Cost per year	\$0	\$0	\$0	\$0

Assumptions / Notes:

**0%** Post-permit adjustment: percentage of annual costs for field facilities, wells, environmental compliance and other capital construction services in year 50 that continue in perpetuity

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## MEMORANDUM

**Date:** April 6, 2012

**From:** Sally Nielsen

**Subject:** **Assessment of Open Space Land Sales Used in the Santa Clara Valley Habitat Plan Economic Analysis**

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Land acquisition cost factors used in the Santa Clara Valley Habitat Plan budget estimates are based on analysis of land transactions involving open space lands in Santa Clara County. Staff of Smith & Associates compiled the transactions data, and Hausrath Economics Group (HEG) developed the cost factors in consultation with other members of the consultant team and with input from staff of the Santa Clara County Open Space Authority, Santa Clara County Parks and Recreation Department, and The Nature Conservancy. This memorandum presents the detailed transactions and some analyses of the transactions used to identify patterns and trends.

It is important to remember that the average cost factors developed for the purpose of producing planning-level estimates of a permit-term budget for the HCP /NCCP represent a best estimate of an expected cumulative pattern over many transactions. As illustrated in the data that follow, the individual transactions range substantially around the average. Any one transaction will be influenced by a number of property characteristics, including the circumstances and inclinations of the seller.

The original transactions list compiled by Smith & Associates in 2007 consisted of 34 sales. Two of the transactions were easement acquisitions; the rest were fee title transactions. The sources for the list included County Assessor's records and maps, CoStar Comps, a digital mapping system, and information provided by the Management Team including information on transactions completed by the Santa Clara County Open Space Authority, The Nature Conservancy, and the Silicon Valley Land Conservancy. To update estimated costs in 2011, we added information about more recent transactions completed by Santa Clara County Parks and the Santa Clara County Open Space Authority in 2009 and 2010. **Figure 1** at the end of this memorandum lists all of the transactions and shows the type of information gathered about each.

The transactions list used to develop the land cost factors covers transactions dating back to October 1999. The most recent transactions included in the analysis are three Open Space Authority acquisitions concluded in 2010. There are transactions recorded for each of the years in the 1999 – 2010 period.

From the universe of all land sales transactions in Santa Clara County over this time period, the list represents a limited set of sales primarily for open space use. Sales determined to be speculative, i.e., large parcels with agricultural zoning but that could have longer-term subdivision potential, were specifically excluded. Some of the sales do reflect values associated with large home sites on “ranchland” tracts. Almost all of the transactions involve parcels outside urban limit lines and the “Planning Limit of Urban Growth”.

To derive representative average cost factors for use in the Santa Clara Valley Habitat Plan implementation cost and budget analysis, we considered a number of parcel characteristics: parcel size, topography, location, and land cover. Location captured the variations in topography and many of the variations in land cover, so we focused the analysis on location and parcel size.

**Figure 2** defines the locations used in the land cost analysis. We used the same zones defined for the impact assessment of rural development, combining Almaden Valley and Valley Floor because of the small number of sales observations in these areas and the similarity in parcel characteristics. Because of the small number of transactions identified in the Remote Hills, we used the full range of Hill-area transactions to derive representative cost factors.

Because the data collection and analysis focus on a limited set of land sales transactions, we collected sales records as far back as 1999, in order to generate a workable number of observations. **Figure 3** shows price per acre by sale date for the 40 fee title transactions. The earliest fee title transactions were in the range of \$15,000 to \$20,000 per acre (pasture land near Gilroy and wetlands near Guadalupe Slough). Through 2004, most sales averaged under \$10,000 per acre. After 2004, there are some large spikes in the average price. From mid-2007 onwards, prices were more likely to be in the range of \$5,000 to \$10,000 per acre.

These types of land sales transactions are not as predictable as those of the more standardized market for land that has some future development potential. Each sale is idiosyncratic, and there is a substantial range of variation. In recognition of this inherent volatility, we determined that all of the transactions going back to 1999 provided a valid basis for developing average cost factors for the Santa Clara Valley Habitat Plan.

**Table 1** summarizes the characteristics of the fee title transactions, by location and parcel size. Where there are enough observations by category, the table presents the statistics that were used to develop the average cost factors. There are outliers in many of the cells. Analyzing the weighted average sale price (total transaction value divided by total acres), instead of the simple average, reduces the bias introduced by the outliers when the number of observations is small. The table also presents the resultant land cost assumptions for each cell.

**Table 1**  
**Land Transactions Data Summarized by Location and Parcel Size Category**

	Less than 50 acres	50 - 250 acres	Over 250 acres	Total All Parcels
<b>Near East Hills</b>				
Number of observations	1	2	5	8
Mean (weighted by parcel size)	\$27,501	\$9,322	\$7,553	\$8,071
Median		\$9,399	\$5,461	\$9,399
Minimum/Maximum		\$8,798 / \$10,000	\$3,006 / \$19,594	\$3,006 / \$27,501
<b>SCV Habitat Plan Assumption</b>	<b>\$28,000</b>	<b>\$9,000</b>	<b>\$8,000</b>	
<b>Near West Hills</b>				
Number of observations	1	5	2	8
Mean (weighted by parcel size)	\$3,535	\$7,558	\$7,495	\$7,460
Median		\$4,501	\$8,141	\$5,391
Minimum/Maximum		\$2,904 / \$18,393	\$6,280 / \$10,003	\$2,904 / \$18,393
<b>SCV Habitat Plan Assumption</b>	<b>\$28,000</b>	<b>\$9,000</b>	<b>\$8,000</b>	
<b>Remote East Hills</b>				
Number of observations			1	1
Mean (weighted by parcel size)			\$1,800	\$1,800
Median				
Minimum/Maximum				
<b>SCV Habitat Plan Assumption</b>	<b>\$10,000</b>	<b>\$9,000</b>	<b>\$6,000</b>	
<b>Remote West Hills</b>				
Number of observations	7	9	2	14
Mean (weighted by parcel size)	\$10,303	\$9,912	\$4,596	\$9,178
Median	\$10,000	\$6,757	\$4,651	\$7,212
Minimum/Maximum	\$5,469 / \$15,500	\$2,511 / \$27,714	\$2,015 / \$7,108	\$2,015 / \$27,714
<b>SCV Habitat Plan Assumption</b>	<b>\$10,000</b>	<b>\$9,000</b>	<b>\$6,000</b>	
<b>Almaden Valley / Valley Floor</b>				
Number of observations	1	1	5	5
Mean (weighted by parcel size)	\$34,316	\$2,904	\$15,557	\$14,722
Median			\$16,610	\$18,884
Minimum/Maximum			\$8,879 / \$19,594	\$2,904 / \$34,316
<b>SCV Habitat Plan Assumption</b>	<b>\$34,000</b>	<b>\$17,000</b>	<b>\$16,000</b>	
<b>Total all Areas</b>				
Number of observations	10	17	15	42
Mean (weighted by parcel size)	\$15,181	\$8,850	\$7,387	\$7,908
Median	\$10,525	\$6,757	\$8,879	\$8,129
Minimum/Maximum	\$3,535 / \$34,316	\$2,904 / \$27,714	\$1,800 / \$19,594	\$1,800 / \$34,316

Note: Fee title transactions only. Transactions for parcels that straddle more than one location appear as an observation in each location.  
SOURCE: Smith & Associates and Hausrath Economics Group.

The average price per acre ranges from a low of \$1,800 per acre for 2,900 acres of ranchland in the Remote East Hills (transaction completed in May 2006) to a high of \$34,300 per acre for just

under 50 acres of row crop land near Gilroy (transaction completed in September 2005). In most locations with multiple transactions, the sales prices analyzed range from about \$3,000 per acre up to \$15,000, \$20,000 and \$30,000 per acre.

Generally, the lower average prices are associated with larger parcels. Considering all locations, the weighted average price per acre for large parcels over 250 acres in size is one half the price of parcels less than 50 acres in size.

Agricultural use value is evident in the distinctions between Valley and Hill locations. The range of prices is generally similar among the Hill locations, with parcel size being the distinguishing feature.

**Table 2** summarizes the average cost factors developed based on analysis of these transactions.

**Table 2**  
**Proposed Land Acquisition Cost Assumptions, by location and parcel size**  
**(fee title purchase price per acre in 2010 dollars)**

<b>Location</b>	<b>Less than 50 acres</b>	<b>50 - 250 acres</b>	<b>Over 250 acres</b>
Near East Hills	\$28,000	\$9,000	\$8,000
Near West Hills	\$28,000	\$9,000	\$8,000
Remote East Hills	\$10,000	\$9,000	\$6,000
Remote West Hills	\$10,000	\$9,000	\$6,000
Almaden Valley / Valley Floor	\$34,000	\$17,000	\$16,000

The assumptions range from a low of \$6,000 per acre for parcels over 250 acres in the Remote East and West Hills. The highest price per acre (\$34,000) is assumed for parcels less than 50 acres in the Almaden Valley and Valley Floor locations.

The expected pattern of land acquisition by location and parcel size affects the overall cost of land acquisition over the permit term. **Table 3** shows the proposed land acquisition pattern.

**Table 3**  
**Acres by Location and Parcel Size, May 2012 Habitat Plan**

<b>Location</b>	<b>Less than 50 acres</b>	<b>50 - 250 acres</b>	<b>Over 250 acres</b>	<b>Total</b>	<b>Percent of Total by Location</b>
Near East Hills	300	2,290	6,180	<b>8,770</b>	<b>24%</b>
Near West Hills	270	640	2,850	<b>3,760</b>	<b>10%</b>
Remote East Hills	20	1,920	9,740	<b>11,680</b>	<b>32%</b>
Remote West Hills	10	820	9,350	<b>10,180</b>	<b>28%</b>
Almaden Valley/Valley Floor	80	390	1,240	<b>1,710</b>	<b>5%</b>
<b>Total</b>	<b>680</b>	<b>6,060</b>	<b>29,360</b>	<b>36,100</b>	<b>100%</b>
<b>Percent of Total by Parcel Size</b>	<b>2%</b>	<b>17%</b>	<b>81%</b>	<b>100%</b>	
NOTE: Input by location and parcel size from SCV HCP/NCCP database. The number of acres acquired is greater than the Reserve Area Managed because the Plan also includes requirements (e.g., connectivity, protection of plant occurrences) that will result in additional acquisitions and because parcels purchased to meet a specific requirement will include additional acres of non-target land cover types.					

Four out of every five acres are assumed to be acquired in large parcels of over 250 acres. More than half (60 percent) of the acres are expected to be acquired in the Remote Hills. Combining this land acquisition pattern with the assumed land cost factors by location and parcel size results in the overall estimate of land acquisition cost. For the May 2012 Habitat Plan, *assuming 100 percent fee title transactions*, the average land acquisition cost per acre acquired would be about \$8,100 per acre. With easement assumptions (50 percent of Remote East Hills and Remote West Hills acres acquired with easements, and easement prices representing 80 percent of fee title value on average), the average land acquisition cost per acre is reduced to \$7,400 per acre.





**FIGURE 1**

**LAND TRANSACTIONS DATA - Compiled in May 2007 for the Santa Clara Valley Habitat Plan Economic Analysis, UPDATED March 2012**

Sale No.	Address	Sale Date	Land Area (acres)	Price	Price per Acre	General Plan/Zoning	Intended Use	Comments
<b>FEE TITLE TRANSACTIONS</b>								
2	Alamitos Road, San Jose 562-23-008	Aug-06	23.08	\$255,000	\$11,049	Hillsides/HS	Open Space	Unimproved Steep Outside urban limit line
3	4280 Casa Loma Road, Morgan Hill	Mar-04	28.29	\$100,000	\$3,535	NA		Unimproved hillside land Sale provided by client
4	Mount Umunhum, San Jose 562-06-009	Dec-03	36.62	\$250,000	\$6,827	Hillsides/HS	Open Space	Unimproved Rolling with riparian habitat Outside urban limit line
5	3995 East Dunne Avenue, Morgan Hill 729-46-006	Jun-06	38.18	\$1,050,000	\$27,501	Regional Parks/AR	Open Space & Public Park	Historic building Flat to rolling Outside urban limit line
6	29961 Mt. Madonna Road, Los Gatos 756-01-016	Jan-06	40.00	\$620,000	\$15,500	Hillsides/HS	Open Space	Had structure on site Steep Outside urban limit line
7	23760 Alamitos Road, San Jose 562-22-002	Jan-02	40.00	\$400,000	\$10,000	Hillsides/HS	Open Space	Had structure on site Steep Outside urban limit line
8	17292 Wagner Road, Los Gatos 537-09-003	Jan-04	41.53	\$500,000	\$12,039	Hillsides/HS	Open Space	Unimproved Hillside with riparian habitat Outside urban limit line
9	Furlong Avenue, Gilroy 841-22-002, 841-22-029	Sep-05	49.54	\$1,700,000	\$34,316	Agriculture, Large Scale/A40	Row Crop	Unimproved Level Outside urban limit line
10	3510 Hecker Pass, Gilroy 810-15-009, 010	Oct-00	66.59	\$1,000,000	\$15,017	Hillsides/HS	Pasture Land	Had structure on site Steep, hilly Outside urban limit line
11	Alamitos Road, SE of Hicks Road, San Jose 742-01-030	Nov-03	67.02	\$500,000	\$7,460	Hillsides/HS	Open Space	Unimproved Steep, hilly Outside urban limit line
12	Alamitos Road, San Jose	Nov-03	74.00	\$500,000	\$6,757	NA		Unimproved hillside land near Almaden Reservoir Sale provided by client
13	21920 Loma Prieta Way, Los Gatos 562-19-020	Apr-04	80.00	\$557,000	\$6,963	Hillsides/HS	Open Space	Had structure on site Hilly Outside urban limit line
14	SW line Pueblo Tract #3, So. Of Calero Reserv 742-13-005	Jan-01	103.29	\$300,000	\$2,904	Hillsides/HS	Open Space	Unimproved Rolling Outside urban limit line At least one endangered plant
15	Alamitos Road, San Jose	Mar-04	109.59	\$400,000	\$3,650	NA		Unimproved hillside land near Almaden Reservoir Sale provided by client
16	Uvas Road, Morgan Hill 742-22-010	Apr-06	142.72	\$2,625,000	\$18,393	Hillsides/HS	Ranch Land	Unimproved Hilly Outside urban limit line
17	Near Loma Prieta Way, Los Gatos 562-19-009	Aug-02	150.00	\$610,000	\$4,067	Hillsides/HS	Open Space	Unimproved Very steep Outside urban limit line
18	Croy Road, Morgan Hill 756-01-012	Apr-01	162.89	\$650,000	\$3,990	Hillsides/HS	Open Space	Unimproved Steep, hilly Outside urban limit line
19	4350 Felter Road, Milpitas 042-05-019	Dec-02	180.00	\$1,800,000	\$10,000	Hillsides/HS	Horse Ranch	Had structure on site Flat to rolling Outside urban limit line
20	17005 Stevens Canyon Road, Cupertino	Apr-03	200.79	\$2,600,000	\$12,949	NA		Unimproved hillside land near Stevens Creek Reservoir Sale provided by client
21	18940 Alum Rock Falls Road, San Jose 595-08-003	Nov-06	233.00	\$2,050,000	\$8,798	Hillsides/HS	Open Space	Had structure on site Hilly Outside urban limit line Steelhead identified at site
22	Stevens Canyon Road, Cupertino 503-04-001, 503-05-016, 039, 503-06-024	Dec-06	238.15	\$6,600,000	\$27,714	Hillsides/HS	Open Space	2,500 s.f. residence Hillside with riparian habitat Outside urban limit line 5 acres of orchards
23	Alamitos Road, SE of Rancho San Vicente, San Jose 742-01-035	Jan-01	248.19	\$1,117,000	\$4,501	Hillsides/HS	Open Space	Unimproved Rolling Outside urban limit line Several species of plants identified
24	19741 Alum Rock Falls Road, San Jose 595-07-014	Apr-01	268.68	\$1,210,000	\$4,503	Hillsides/HS	Open Space	100 yr old house & barn Rolling to sloping Outside urban limit line
25	3245 Pacheco Pass Hwy., Gilroy 841-43-001, 003, 004, 052	Sep-06	316.42	\$6,200,000	\$19,594	Agriculture, Large Scale/A40	Row Crop	Has structures on site Flat, planted in vineyards Outside urban limit line
26	North of Sunnyvale Baylands Park, adjacent to Guadalupe Slough, Sunnyvale and San Jose  015-035-026, 021 (por), 031 (por)	May-00	321.42	\$6,069,500	\$18,883	Private Open Space/ Baylands/Agriculture/ Public Facilities	Restore Tidelands	100% submerged wetlands Flat

**FIGURE 1**

**LAND TRANSACTIONS DATA - Compiled in May 2007 for the Santa Clara Valley Habitat Plan Economic Analysis, UPDATED March 2012**

Sale No.	Address	Sale Date	Land Area (acres)	Price	Price per Acre	General Plan/Zoning	Intended Use	Comments
<b><u>FEE TITLE TRANSACTIONS</u></b>								
27	Uvas Canyon, Morgan Hill	Pending	397.00	\$800,000	\$2,015	NA		Unimproved hillside land near Uvas Reservoir Sale provided by client
28	Coyote Ridge, San Jose	Pending	450.00	\$3,995,518	\$8,879	NA	Open Space	Open space near Anderson Lake Sale provided by client
30	21260 Alum Rock Falls Road, San Jose 627-27-001, 002	Apr-03	520.79	\$2,844,000	\$5,461	Ranchlands/AR	Open Space	\$275,000 in demo costs Hilly, wooded Outside urban limit line Salamander & frog identified
31	Crews Road, Gilroy 841-77-003, 898-27-028	Jan-07	574.08	\$5,836,935	\$10,167	Ranchlands/AR	Open Space	Wetlands and ponds Hillside Outside urban limit line Salamander, frog, kit fox, & burrowing owl identified
32	Casa Loma Road, San Jose 742-14-002, 003, 004	Oct-01	718.47	\$4,512,000	\$6,280	Hillsides/HS	Open Space	Unimproved Hilly Outside urban limit line Several species of plants and animals identified
33	4105 Sierra Road, San Jose 595-07-010, 011, 595-10-046, 595-32-001, 005, 006; 595-33-004, 005, 007	Nov-01	748.48	\$2,250,000	\$3,006	Hillsides/HS	Hold for Development	Unimproved Steep Outside urban limit line
34	Beauregard Road/Mines Road, San Jose 070-07-013, 070-08-008, 009, 010, 070-13-002, 003, 004, 005, 006; 070-09-030	May-06	2,899.00	\$5,218,000	\$1,800	Ranchlands/AR	Open Space	Unimproved Flat Outside urban limit line Several species of native plants identified
35	Clark Canyon 810-10-001	Nov-08	408.00	\$2,900,000	\$7,108	NA	Open Space	Santa Clara County Parks
36	Rancho San Vicente 742-05-015, 742-06-032, 742-08-031 742-08-033, 742-08-057, 742-08-058 742-09-036, 742-09-046, 742-09-049 742-09-050, 742-33-003	Sep-09	966.00	\$16,045,000	\$16,610	NA	Open Space	Santa Clara County Parks Adjacent to Calero County Park
37	Tulare Hill	Oct-09	140.72	\$1,830,000	\$13,005	NA	Open Space	Santa Clara County Parks
38	Dowmar and Johnson	Jun-09	192.00	\$650,000	\$3,385	NA	Open Space	Open Space Authority Adjacent to Rancho Cañada del Oro Open Space Preserve
39	Bosley	Aug-09	10.00	\$100,000	\$10,000	NA	Open Space	Open Space Authority
40	Davis	Mar-10	32.00	\$175,000	\$5,469	NA	Open Space	Open Space Authority Adjacent to Rancho Cañada del Oro Open Space Preserve Oak woodlands, canyons, creeks
41	Coyote Scenic Lands	Apr-10	348.00	\$3,481,000	\$10,003	NA	Open Space	Open Space Authority Wooded foothills, seasonal streams, and grasslands Several special status species
42	Pea	Jun-10	228.00	\$572,450	\$2,511	NA	Open Space	Open Space Authority Adjacent to Rancho Cañada del Oro Open Space Preserve Hilly terrain, stream
<b><u>EASEMENT TRANSACTIONS</u></b>								
1	NW of Coyote Creek Golf Drive, San Jose	Oct-99	7.86	\$160,000	\$20,356	NA	Open Space	Environmental easement for botanic preservation Sale provided by client
29	Carnadero Preserve along Pajaro River, San Jose	May-06	510.00	\$2,100,000	\$4,118	NA		Important riparian habitat Agricultural production Sale provided by client

SOURCE: Smith & Associates, Santa Clara County Parks and Recreation Department, and the Santa Clara County Open Space Authority

## Legend

- Habitat Plan Study Area
- County Boundary
- Rural Residential Development Zone Boundary
- Major Roads
- Reservoirs
- Planning Limit of Urban Growth

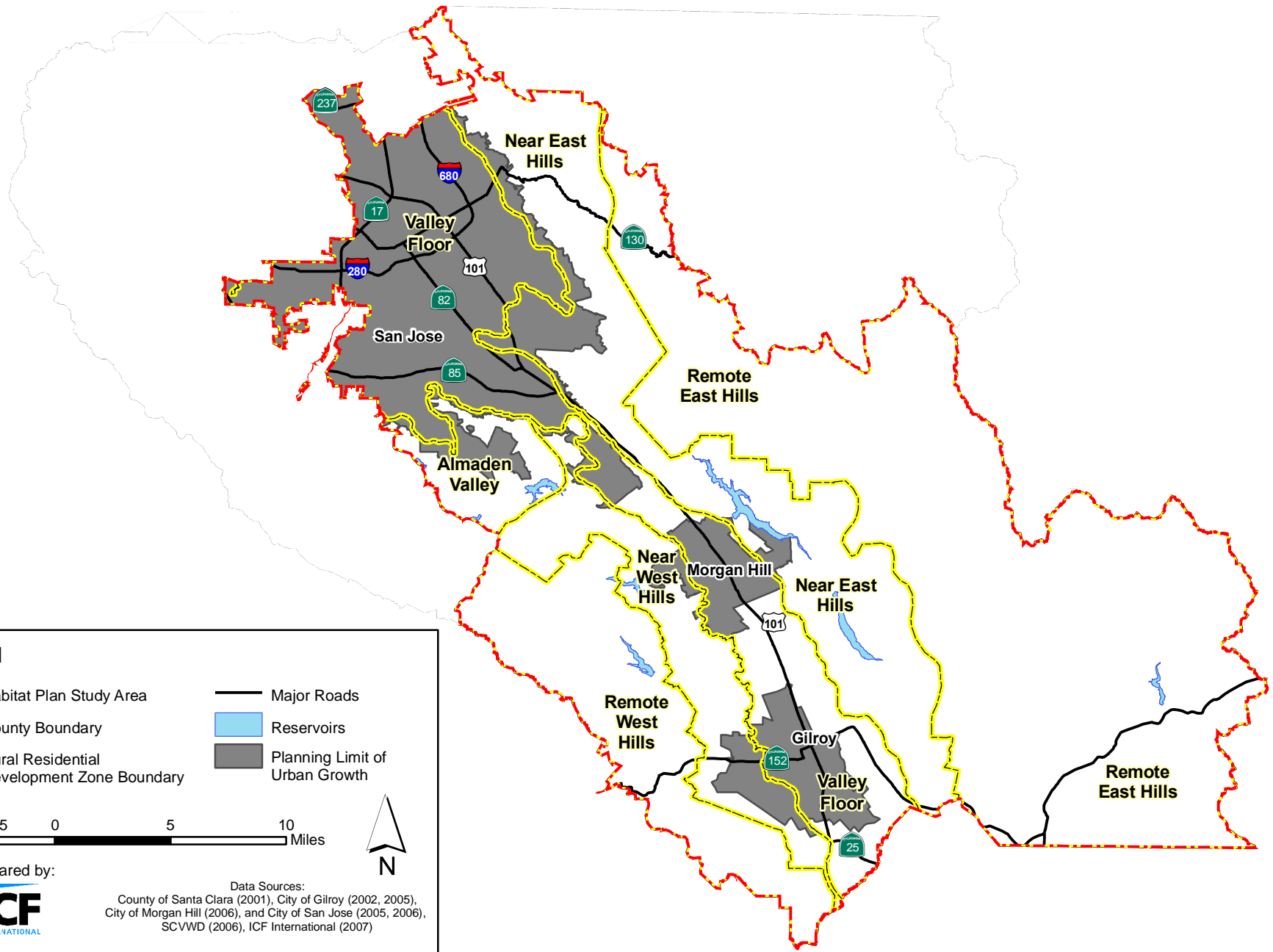
5 2.5 0 5 10 Miles



Prepared by:

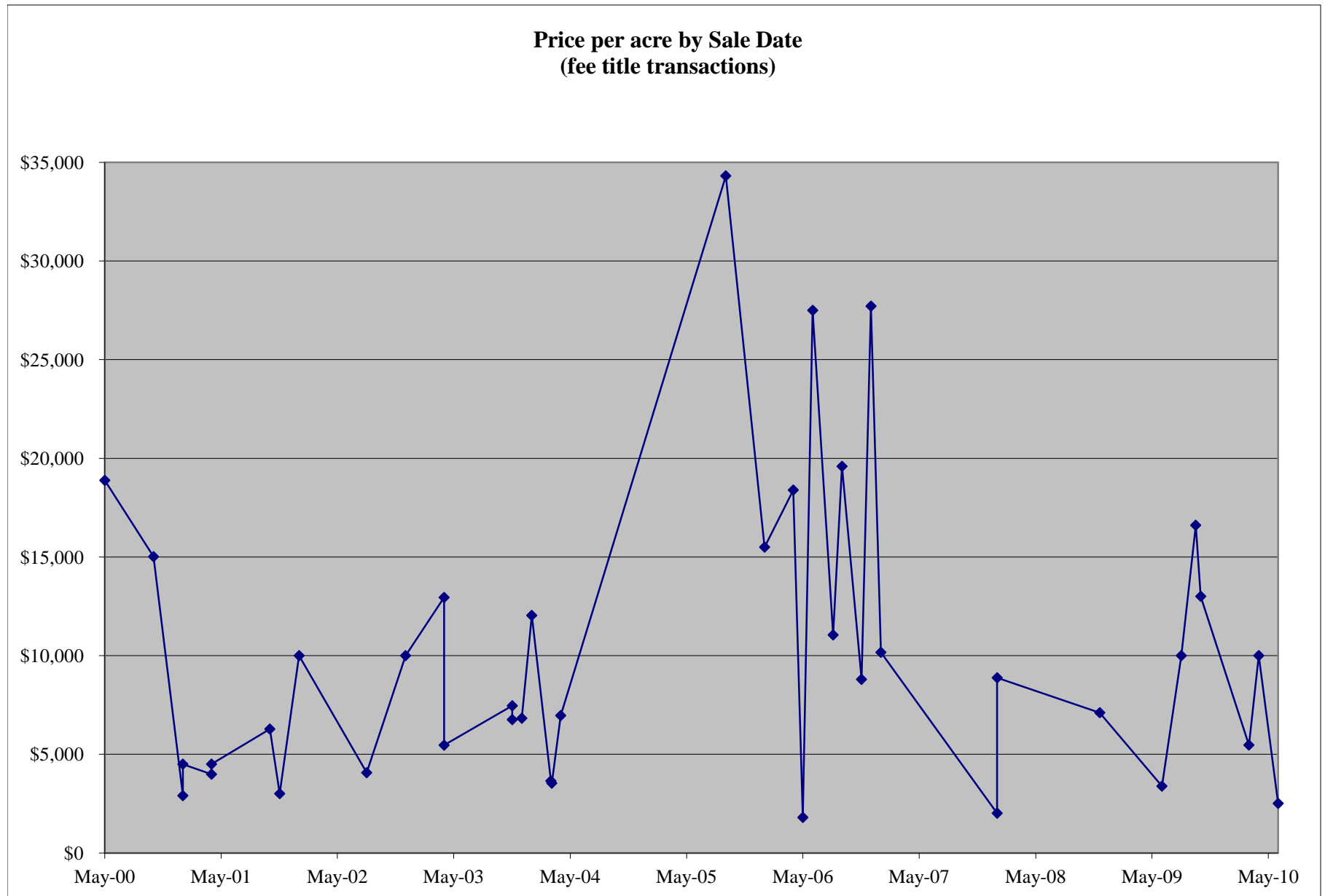


Data Sources:  
County of Santa Clara (2001), City of Gilroy (2002, 2005),  
City of Morgan Hill (2006), and City of San Jose (2005, 2006),  
SCVWD (2006), ICF International (2007)



**Figure 2**  
**Rural Development Zones Used in the Impact Analysis**

**FIGURE 3**



Appendix H

# **Conservation Easement Template**



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RECORDING REQUESTED BY AND )  
WHEN RECORDED MAIL TO: )  
 )  
 )  
[Easement Holder] )  
[Easement Holder's Address] )  
Attention: \_\_\_\_\_ )  
 )

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Space Above Line for Recorder's Use Only

**TEMPLATE NOTES:**

- *This template is prepared for use on privately-owned fee lands. Certain of the provisions below will likely require modification for conservation easements covering Permittee- or other public entity- owned properties (i.e. management plan, recreational uses, and condemnation provisions.)*
- *Consistent with the Habitat Plan, this template assumes the Implementing Entity will hold the conservation easements over privately-owned fee lands. Italicized bracketed language is included below for insertion in conservation easements the Implementing Entity determines will be held by another nonprofit organization, as allowed in the Habitat Plan.*
- *This template does not identify recreational/public access as allowable uses. Additional provisions (i.e. specific restrictions and allowed uses, as well as reference to “recreation plan” contemplated by SVHCP) would need to be included if any recreational uses are contemplated for the Easement Area/Property [use Easement Area or Property, as applicable depending on whether part or all of a legal parcel is being committed to the reserve area, selection made in Recital A].*
- *This template also assumes the Implementing Entity, and not the Landowner, will conduct the management and monitoring activities set forth in the Management Plan.*

**CONSERVATION EASEMENT AGREEMENT**

THIS CONSERVATION EASEMENT AGREEMENT (the “**Agreement**”) is made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between [insert full legal name of landowner] (“**Landowner**”), and [Santa Clara Valley Habitat Agency, a California Joint Powers Authority] (“**Easement Holder**”). Landowner and Easement Holder are also referred to herein individually as a “**Party**” and collectively as the “**Parties**.”

**RECITALS**

A. Landowner is the [insert description of ownership interest] of certain real property

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containing approximately \_\_\_\_\_ acres, located in the County of Santa Clara, State of California, more particularly described in **Exhibit A** attached hereto and incorporated herein by this reference (the “**Property**”) and depicted on the map attached hereto as **Exhibit B** and incorporated herein by reference.

**OR**

A. Landowner is the *[insert description of ownership interest]* of certain real Property located in the County of Santa Clara, State of California, more particularly known as Assessor’s Parcel Number(s) XXXXXX. Landowner intends to grant this Conservation Easement over approximately xx acres of the Property (the “**Easement Area**”), as described in **Exhibit A** attached hereto and incorporated herein by this reference and depicted on the map attached hereto as **Exhibit B** and incorporated herein by reference.

B. This Agreement is being executed and delivered to satisfy certain habitat conservation requirements set forth in the following documents (collectively, the “**Habitat Plan Instruments**”):

(i) The Santa Clara Valley Habitat Plan (“**Habitat Plan**”), dated \_\_\_\_\_, prepared by County of Santa Clara County (“**County**”), City of San Jose (“**San Jose**”), City of Gilroy (“**Gilroy**”), City of Morgan Hill (“**Morgan Hill**”), Santa Clara Valley Water District (“**Water District**”), and Santa Clara Valley Transportation Authority (“**VTA**”), and approved by the United States Fish and Wildlife Service (“**USFWS**”) under Section 10 of the federal Endangered Species Act of 1973 (16 U.S.C. Section 1531 *et seq.*, as it may be amended from time to time) (“**ESA**”), and by California Department of Fish and Game (“**CDFG**”) under the California Natural Community Conservation Planning Act (California Fish and Game Code Section 2800 *et seq.*, as it may be amended from time to time) (“**NCCPA**”); and

(ii) Implementing Agreement for the Santa Clara Valley Habitat Plan (the “**Implementing Agreement**”), dated \_\_\_\_\_, by and among USFWS and CDFG (collectively, the “**Wildlife Agencies**”), Santa Clara Valley Habitat Plan Implementing Agency, a Joint Powers Authority (“**JPA**” or “**Implementing Entity**”), County, San Jose, Gilroy, Morgan Hill, Water District, and VTA (collectively, JPA, County, San Jose, Gilroy, Morgan Hill, Water District, VTA, are referred to herein as “**Permittees**”); and

(iii) The federal incidental take permit issued by USFWS to Permittees for the Habitat Plan pursuant to Section 10 of ESA; and

(iv) The state incidental take permit issued by CDFG to Permittees for the Habitat Plan pursuant to the NCCPA.

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C. CDFG has jurisdiction, pursuant to Fish and Game Code Section 1802, over the conservation, protection, and management of fish, wildlife, native plants and the habitat necessary for biologically sustainable populations of those species, and CDFG is authorized to hold easements for these purposes pursuant to Civil Code Section 815.3, Fish and Game Code Section 1348, and other provisions of California law.

D. USFWS is an agency of the United States Department of the Interior and is authorized by Federal law to be a third party beneficiary of the Conservation Easement and to administer the Federal Endangered Species Act, 16 U.S.C. § 1531, et seq. (“ESA”), the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666c, and the Fish and Wildlife Act of 1956, 16 U.S.C. § 742(f), et seq.

E. The Easement Holder is a California joint powers authority, and authorized to hold conservation easements pursuant to, among other provisions of law, California Civil Code Section 815.3.

F. In addition to serving as the holder of the conservation easement interest created under this Agreement, JPA also serves as the “Implementing Entity” of the Habitat Plan, and as such, is responsible for overseeing implementation of the Habitat Plan Instruments, including carrying out planning and design, habitat restoration, monitoring, adaptive management programs, and periodic coordination with USFWS and CDFG. *[When used herein, the term “Implementing Entity” refers to the JPA acting in its capacity as the Implementing Entity under the Habitat Plan and the Implementing Agreement, which confer separate rights and obligations on JPA that will survive any future transfer of the Conservation Easement by JPA. In contrast, the term “Easement Holder” is used herein to refer to JPA as the initial holder of such conservation easement interest, as well as any other qualified successor or assignee to which this conservation easement interest has been transferred in accordance with the terms and conditions set forth below.] [TEMPLATE NOTE: The italicized language above will require revision if JPA is not the Easement Holder.]*

G. The *Easement Area/Property* possesses wildlife, habitat values, and associated open space values that are of great importance to Easement Holder, the people of Santa Clara County and the people of the State of California and of the United States (the “**Conservation Values**”). The **Initial Conservation Values**, described in **Exhibit C** attached hereto and incorporated herein by reference, are those Conservation Values that are identified in the Habitat Plan and present on the Easement Area/Property at the time of the execution of the Agreement.

H. Following recordation of this Agreement, the *Easement Area/Property* will be incorporated into the Reserve System (as such term is defined in the Habitat Plan) (“**Reserve System**”) and will count toward the land acquisition requirements set forth in the Habitat Plan.

I. The Implementing Entity *[has developed] [will develop]* a management plan, known as “\_\_\_\_\_,” that applies to the *Easement Area/Property* (the “**Management Plan**”). The Management Plan *[has been] [will be]* developed in accordance with the applicable requirements of the Habitat Plan Instruments *[and [identify any applicable reserve unit management*

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plans]].

J. The Management Plan *[is] [upon completion, will be]* incorporated herein by reference. Landowner and Easement Holder recognize that changes (e.g., in weather cycles, natural resource management technologies, conservation practices) may dictate an adaptation in the management of the *Easement Area/Property*, consistent with the purposes of this Conservation Easement and the Habitat Plan Instruments. It may be revised from time to time with the written approval of the Landowner, Easement Holder and the Wildlife Agencies, so long as the revisions are consistent with the requirements of the Habitat Plan Instruments *[and [identify applicable reserve unit management plans]]*. A full and complete copy of the current Management Plan, including any such revisions, shall be kept on file at the offices of the Implementing Entity. *[Include if the Management Plan has not been developed as of the effective date of the agreement: The Easement Area/Property will be managed in accordance with the applicable requirements of the Habitat Plan until the Management Plan is developed.]*

K. The State of California recognizes the public importance and validity of conservation easements by enactment of California Civil Code Section 815 *et seq.*

## AGREEMENTS

NOW, THEREFORE, in consideration of the above and mutual covenants, terms, conditions and restrictions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and pursuant to the laws of the State of California, including California Civil Code Section 815 *et seq.*, Landowner hereby voluntarily grants and conveys to Easement Holder, its successors and assigns, a conservation easement in gross forever in, on, over and across the Easement Area/Property described in Exhibit A and depicted on Exhibit B (the “**Conservation Easement**”), subject to the terms and conditions set forth herein, restricting forever the uses which may be made of the Easement Area/Property, and the parties agree as follows:

1. **Purpose.** The purpose of this Conservation Easement is to ensure that existing and future natural values and associated wildlife and habitat values of the *Easement Area/Property* will be forever protected by preventing any use of the *Easement Area/Property* that would impair or interfere with the Conservation Values. Landowner intends that this Conservation Easement will confine the use of the *Easement Area/Property* to such activities that are consistent with the purposes set forth herein, including, without limitation, those involving the preservation, restoration, and enhancement of the *Easement Area/Property*’s Covered Species and their habitats.

2. **Baseline Documentation Report.** The parties acknowledge that a Baseline Documentation Report (the “**Report**”) has been prepared for the *Easement Area/Property* and approved in writing by Landowner and Easement Holder. A copy of the Report is on file with Landowner and Easement Holder at their respective addresses for notices set forth below. The parties agree that the Report contains an accurate representation of the biological and physical condition of the *Easement Area/Property* at the time this Agreement is recorded in the Official Records of Santa Clara County (“**Official Records**”), including a full inventory of all of the

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*Easement Area/Property's* Covered Species and natural communities found thereon.

Notwithstanding the foregoing, if a controversy arises with respect to the nature and extent of the physical or biological condition of the *Easement Area/Property* or the allowed uses of the *Easement Area/Property*, the parties shall not be foreclosed from utilizing any and all other relevant documents, surveys or other evidence or information to assist in the resolution of the controversy.

3. **Rights of Easement Holder.** To accomplish the purposes of this Conservation Easement, Landowner hereby grants and conveys the following rights to Easement Holder:

(a) To preserve, protect, sustain, restore, and enhance the Conservation Values for the *Easement Area/Property* described in **Exhibit C** or which develop on the *Easement Area/Property* in accordance with the Management Plan and the terms and conditions of this Conservation Easement;

(b) To enter upon the *Easement Area/Property* to monitor Landowner's compliance with, and to otherwise enforce the terms of, this Conservation Easement, and for scientific research necessary to support monitoring and in order to support adaptive management of the Conservation Values; *provided*, that Easement Holder shall not unreasonably interfere with Landowner's allowed uses and quiet enjoyment of the *Easement Area/Property*;

(c) To enter upon the *Easement Area/Property* to carry out, at Easement Holder's sole cost and expense, those management and monitoring requirements applicable to the Easement Area/Property that are set forth in the Management Plan and in Habitat Plan Chapters 5 and 7, *[including, without limitation, installation and maintenance of fencing around the perimeter of the Easement Area/Property to the extent referenced in the Management Plan as necessary to protect the Conservation Values;]* *provided*, that Easement Holder shall use reasonable good faith efforts to conduct such management and monitoring activities in a manner that does not unreasonably interfere with Landowner's allowed uses and quiet enjoyment of the *Easement Area/Property*;

(d) To prevent any activity on or use of the Easement Area/Property that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features of the Easement Area/Property that may be damaged by any act, failure to act, or any use that is inconsistent with the purposes of this Conservation Easement;

(e) To require that all mineral, air and water rights held by Landowner that Easement Holder deems necessary to preserve, protect and sustain the biological resources and Conservation Values of the *Easement Area/Property* shall remain a part of and be put to beneficial use upon the *Easement Area/Property*, consistent with the purposes of this Conservation Easement; and

(f) All present and future development rights and wind power rights allocated, implied, reserved or inherent in the *Easement Area/Property*; such rights are hereby

terminated and extinguished, and may not be used on or transferred to any portion of the Property. Landowner understands and agrees that nothing in this Conservation Easement relieves Landowner of any obligation or restriction in relation to the development or use of the *Easement Area/Property* imposed by law, including but not limited to local land use restrictions.

Except where there is an imminent threat to the *Easement Area/Property* or its Conservation Values, Easement Holder and its employees, contractors or agents will only enter the Easement Area/Property at reasonable times and with at least forty-eight (48) hours advance notice to Landowner. The Landowner may waive these requirements in whole or in part by written notice to Easement Holder.

4. **Prohibited Uses.** Any activity on or use of the *Easement Area/Property* that adversely affects the purposes of this Conservation Easement is prohibited. Without limiting the generality of the foregoing, Landowner, Landowner's personal representatives, heirs, successors, assigns, employees, agents, lessees, licensees and invitees are expressly prohibited from doing or allowing any of the following uses and activities on the *Easement Area/Property*, unless, and then only to the extent that, a generally prohibited activity set forth below is: (i) an allowed use or practice (e.g., agricultural, rangeland or recreational uses) set forth on **Exhibit D** attached hereto and incorporated herein by reference; (ii) a management practice set forth in the Management Plan, (iii) necessary in connection with the performance of any of the conservation actions described in Habitat Plan Chapter 5; or (iv) otherwise necessary to maintain or enhance the Conservation Values:

- (a) Unseasonal watering;
- (b) Use of fertilizers, pesticides, biocides, herbicides or other chemicals;
- (c) Use of off-road vehicles and use of any other motorized vehicles except on existing roadways, excepting off-road vehicle use required to conduct any allowed management practice set forth in the Management Plan;
- (d) Any construction, reconstruction, relocation or placement of any road, building, billboard, fencing, or sign, or any other structure or improvement of any kind, or altering the surface or general topography of the *Easement Area/Property* without written approval by the Easement Holder and Wildlife Agencies unless otherwise allowed in the Management Plan;
- (e) Agricultural uses, including, without limitation, vineyards, nurseries, or intensive livestock use (e.g., dairy, feedlot) except as may be provided for in the Management Plan (e.g., prescribed grazing);
- (f) Any legal or de facto division, subdivision or partitioning of the *Easement Area/Property* or any fee transfer of less than the entire Easement Area/Property;

- (g) Depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other materials;
- (h) Planting, introduction, or dispersal of nonnative plant or animal species;
- (i) Filling, dumping, excavating, draining, dredging, mining, drilling, removing, or exploring for or extraction of minerals, loam, soil, sands, gravel, rocks, or other material on or below the surface of the *Easement Area/Property*, and granting or authorizing any surface entry for any of these purposes;
- (j) Removing, destroying, or cutting of trees, shrubs, or other vegetation;
- (k) Manipulating, impounding, or altering any water course, body of water, or water circulation on the *Easement Area/Property*, and activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or subsurface waters; and
- (l) Without the prior written consent of Easement Holder, which Easement Holder may reasonably withhold, transferring, encumbering, selling, leasing or otherwise separating the mineral, air or water rights for the *Easement Area/Property* owned by Landowner; changing the place or purpose of use of the water rights owned by Landowner; abandoning or allowing the abandonment of, by action or inaction, any water or water rights, ditch or ditch rights, spring rights, reservoir or storage rights, wells, ground water rights or other rights in and to the use of water historically used on or otherwise appurtenant to the *Easement Area/Property* that are owned by Landowner, including but not limited to: (i) riparian water rights; (ii) appropriative water rights; (iii) rights to waters which are secured under contract with any irrigation or water district, to the extent such waters are customarily applied to the *Easement Area/Property*; and (iv) any water from wells that are in existence or may be constructed in the future on the *Easement Area/Property*.

***[TEMPLATE NOTE: Section 4 “Prohibited Uses” for any Conservation Easement may include additional prohibited uses, or refinements of the above, to address specific site conditions, Landowner preferences and operations, and species and habitat needs, as contemplated by Habitat Plan Section 8.6.3 and approved by the Easement Holder and the Wildlife Agencies. Additionally, this prohibited uses section may require modification to address public access and recreation uses to the extent contemplated or required at the Easement Area/Property under the Management Plan.]***

5. **Unlawful Entry.** Landowner shall undertake all reasonable actions to prevent the unlawful entry and trespass on the *Easement Area/Property* by persons whose uses or activities may degrade or harm the Conservation Values or are otherwise inconsistent with the purposes of this Conservation Easement.



6. **Landowner's Reserved Rights; Allowed Uses.** Landowner reserves to itself, and to its personal representatives, heirs, successors, and assigns, all rights accruing from its ownership of the *Easement Area/Property*, including without limitation, the following (collectively, the “**Allowed Uses**”): (a) those specific uses and activities identified in the Management Plan(s) or detailed in **Exhibit D** attached hereto, and (b) all other uses of the *Easement Area/Property* that are not expressly prohibited or limited by this Agreement, and are consistent with the purposes of this Conservation Easement as set forth in Section 1. Landowner shall have the right to exercise any of the Allowed Uses directly or to allow or invite others to engage in any of the Allowed Uses. While Landowner is not obligated under this Agreement to perform the management and monitoring actions set forth in the Management Plan(s), Landowner's exercise of the Allowed Uses shall be conducted in a manner that is consistent with the Management Plan(s) and Conservation Values.

7. **Easement Holder's Remedies.** If Easement Holder or any Third-Party Beneficiary (as defined in **Section 7(d)** below) determines there is a violation of the terms of this Agreement or that such violation is threatened, written notice of such violation and a demand for corrective action sufficient to cure the violation shall be given to Landowner, with a copy provided to Easement Holder and each other Third-Party Beneficiary. The notice of violation shall specify the measures the Landowner must take to cure the violation. If Landowner fails to cure the violation within thirty (30) days after receipt of written notice and demand from Easement Holder or any Third-Party Beneficiary, as applicable; or if the cure reasonably requires more than thirty (30) days to complete and Landowner fails to begin the cure within such thirty (30) day period; or Landowner fails to continue diligently to complete the cure, Easement Holder or any Third-Party Beneficiary may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Agreement, to recover any damages to which Easement Holder and the Third-Party Beneficiaries may be entitled for violation of the terms of this Agreement or for any injury to the Conservation Values, to enjoin the violation, *ex parte* as necessary, by temporary or permanent injunction without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies, or for other equitable relief, including, but not limited to, the restoration of the *Easement Area/Property* to the condition in which it existed prior to any such violation or injury. Without limiting Landowner's liability therefor, any damages recovered may be applied to the cost of undertaking any corrective action on the *Easement Area/Property* at the election of the party receiving such damages.

If Easement Holder or any Third-Party Beneficiary, each in its sole discretion, determines that circumstances require immediate action to prevent or mitigate damage to the Conservation Values, Easement Holder and/or any Third-Party Beneficiary may pursue its remedies under this section without prior notice to Landowner or without waiting for the period provided for cure to expire. The rights of Easement Holder and the Third-Party Beneficiaries under this section apply equally to actual or threatened violations of the terms of this Agreement. Landowner agrees that Easement Holder's and Third-Party Beneficiaries' remedies at law for any violation of the terms of this Agreement are inadequate and that Easement Holder and/or any Third-Party Beneficiary shall be entitled to the injunctive relief described in this section, both prohibitive and mandatory, in addition to such other relief to which Easement Holder and the Third-Party Beneficiaries may be entitled, including specific performance of the terms of this Agreement, without the necessity of

proving either actual damages or the inadequacy of otherwise available legal remedies. Remedies described in this section shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity, including but not limited to, the remedies set forth in California Civil Code Section 815, *et seq.* The failure of Easement Holder or any Third-Party Beneficiary to discover a violation or to take immediate legal action in response to such action shall not bar such party from taking legal action at a later time.

(a) **Costs of Enforcement.** Any reasonable costs incurred by the Easement Holder or any Third Party Beneficiary, where it is the prevailing party, in enforcing the terms of this Conservation Easement against the Landowner, including, but not limited to, costs of suit and attorneys' and experts' fees, and any costs of restoration necessitated by Landowner's negligence or breach of this Agreement shall be borne by Landowner. In any action where an agency of the United States is a party, the right to recover fees and costs shall be governed by federal law.

(b) **Enforcement Discretion.** Enforcement of the terms of this Agreement against Landowner shall be at the respective discretion of Easement Holder and each of the Third-Party Beneficiaries, and any forbearance by any such party to exercise its rights under this Agreement in the event of any breach of any term of this Agreement shall not be deemed or construed to be a waiver by such party of such term or of any subsequent breach of the same or any other term of this Agreement or of any of such party's rights under this Agreement. No delay or omission by Easement Holder or any Third-Party Beneficiary in the exercise of any right or remedy upon any breach shall impair such right or remedy or be construed as a waiver.

(c) **Acts Beyond Landowner's Control.** Nothing contained in this Agreement shall be construed to, or shall entitle, Easement Holder or any Third-Party Beneficiary to bring any action against Landowner for any injury to or change in the *Easement Area/Property* resulting from (i) any natural cause beyond Landowner's control, including, but not limited to, climate change, fire not caused by Landowner, flood, storm, and earth movement, or any prudent action taken by Landowner under emergency conditions to prevent, abate, or mitigate significant injury to the *Easement Area/Property* resulting from such causes; (ii) acts by Easement Holder or any Third-Party Beneficiary or any of their employees, contractors or agents; or (iii) acts by persons that entered the *Easement Area/Property* unlawfully or by Trespass whose activities degrade or harm the Conservation Values of the *Easement Area/Property* or whose activities are otherwise inconsistent with this Conservation Easement where Landowner has undertaken all reasonable actions to prevent such activities [*for public agencies only: or (iii) acts by persons that entered the Easement Area/Property lawfully or unlawfully whose activities degrade or harm the Conservation Values of the Easement Area/Property or whose activities are otherwise inconsistent with this Conservation Easement where Landowner has undertaken all reasonable actions to discourage or prevent such activities*].



(d) **Third Party Beneficiary Rights.** The parties intend for each of Implementing Entity (during any such period, if any, that Implementing Entity does not also constitute Easement Holder), USFWS and CDFG (collectively, **“Third-Party Beneficiaries”**) to be a third-party beneficiary of this Agreement. All rights and remedies conveyed to Easement Holder under this Agreement shall extend to and are enforceable by each of the Third-Party Beneficiaries in accordance with the terms hereof. Landowner and Easement Holder acknowledge that, as third party beneficiaries of this Conservation Easement, the Third-Party Beneficiaries shall have the same rights of access to the *Easement Area/Property* granted to Easement Holder in **Section 3** above, and with rights to enforce all of the provisions of this Agreement. If at any time in the future Landowner uses, allows the use, or threatens to use or allow use of, the *Easement Area/Property* for any purpose that is inconsistent with or in violation of this Agreement then, despite the provisions of California Civil Code Section 815.7, the California Attorney General and each Third-Party Beneficiary has standing as an interested party in any proceeding affecting the Conservation Easement. These rights are in addition to, and do not limit, the rights of enforcement under the Habitat Plan Instruments. In addition, if CDFG reasonably determines that the *Easement Area/Property* is not being held, monitored, or stewarded for conservation purposes in the manner specified in this Agreement, the Habitat Plan Instruments, or the Management Plan, the Conservation Easement shall revert to the State of California or another entity as described in California Government Code Section 65967, subdivisions (b) and (c), and subject to approval by CDFG.

8. **Public Access.** Nothing contained in this Agreement gives or grants to the public an independent right to enter upon or use the *Easement Area/Property* or any portion thereof. Nor shall this Agreement extinguish any public right to enter upon or use the *Easement Area/Property*.

9. **Costs and Liabilities.** Except for those specific obligations to be undertaken by Easement Holder under Section 3 above, Landowner shall retain all responsibilities and shall bear all costs and liabilities of any kind related to Landowner’s ownership, operation, management, and maintenance activities on and relating to the *Easement Area/Property*. Landowner agrees that neither the Easement Holder nor Third Party Beneficiaries shall have any duty or responsibility for the operation or maintenance of the *Easement Area/Property*, the monitoring of hazardous conditions thereon, or the protection of Landowner, the public or any third parties from risks relating to conditions on the *Easement Area/Property*. Each of Landowner and Easement Holder shall remain responsible for obtaining any applicable governmental permits and approvals for any of such Party’s activity or use allowed on the *Easement Area/Property* under this Agreement, and each of Landowner and Easement Holder shall undertake all allowed activities and uses of the *Easement Area/Property* in accordance with all applicable federal, state, local and administrative agency statutes, ordinances, rules, regulations, orders and requirements. Landowner shall pay before delinquency all taxes, assessments, fees, and charges of whatever description levied on or assessed against the *Easement Area/Property* by competent authority (collectively **“taxes”**), including any taxes imposed upon, or incurred as a result of, this Agreement, and shall furnish Easement Holder with satisfactory evidence of payment upon request. Landowner and Easement Holder shall keep the *Easement Area/Property* free from any liens, including those arising out of any obligations incurred

by such Party for any labor or materials furnished or alleged to have been furnished to or for such Party at or for use on the *Easement Area/Property*.

10. **Indemnification.**

(a) **Indemnification by Landowner.** Landowner shall hold harmless, protect and indemnify Easement Holder and the Third-Party Beneficiaries, and their respective members, directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a **“Landowner Indemnified Party”** and, collectively, the **“Landowner Indemnified Parties”**) from and against any and all liabilities, penalties, costs, losses, damages, expenses (including, without limitation, reasonable attorneys' and experts' fees and costs), causes of action, claims, demands, orders, liens or judgments (each a **“Claim”** and, collectively, **“Claims”**), arising from or in any way connected with: (i) the activities of Landowner on the *Easement Area/Property*; (ii) the inaccuracy of any representation or warranty made by Landowner in this Agreement; (iii) the breach by Landowner of any provision of this Agreement; (iv) any injury to or the death of any person, or physical damage to any *Easement Area/Property* resulting from any act, omission, condition, or other matter related to or occurring on or about the *Easement Area/Property*, unless such injury or death or physical damage to any *Easement Area/Property* relates to an activity on, or use of, the *Easement Area/Property* by Easement Holder, including without limitation, those activities performed under the Management Plan, or negligent or willful misconduct of the Landowner Indemnified Party; or (v) any violation of, or failure to comply with, any state, federal or local law, regulation or requirement, by Landowner, or by any entity, other than one of the Landowner Indemnified Parties, acting at the time upon permission from Landowner, in any way affecting, involving or relating to the *Easement Area/Property*. If any action or proceeding is brought against any of the Landowner Indemnified Parties by reason of any such Claim, Landowner shall, at the election of and upon written notice from Easement Holder and the Third-Party Beneficiaries, defend such action or proceeding by counsel reasonably acceptable to the Landowner Indemnified Party.

(b) **Indemnification by Easement Holder.** Easement Holder shall hold harmless, protect, and indemnify Landowner and the Third-Party Beneficiaries, and their respective members, directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each, an **“Easement Holder Indemnified Party,”** and collectively, the **“Easement Holder Indemnified Parties”**) from and against any and all Claims arising from or in any way connected with: (a) the activities of Easement Holder on the *Easement Area/Property*, including without limitation the Easement Holder's performance of management and monitoring activities set forth in the Management Plan; (b) breach by Easement Holder of any provision of this Agreement; (c) any injury to or the death of any person, or physical damage to any *Easement Area/Property* occurring on or about the *Easement Area/Property* resulting from any act, omission, condition, or other matter related to, an activity on, or use of, the *Easement Area/Property* by Easement Holder, including without limitation, those

performed under the Management Plan, unless due solely to the negligence or willful misconduct of the Easement Holder Indemnified Party; and (d) any violation of, or failure to comply with, any state, federal or local law, regulation or requirement, by Easement Holder in any way affecting, involving or relating to the *Easement Area/Property*. If any action or proceeding is brought against any of the Easement Holder Indemnified Parties by reason of any such Claim, Easement Holder shall, at the election of and upon written notice from Landowner, defend such action or proceeding by counsel reasonably acceptable to the Easement Holder Indemnified Party.

11. **Extinguishment.** The Conservation Easement created by this Agreement constitutes a property right. It is the Parties' intention that the terms and conditions of this Agreement shall be carried out in perpetuity. Liberal construction is expressly required for purposes of effectuating the Conservation Easement in perpetuity, notwithstanding economic hardship or changed conditions of any kind. If circumstances arise in the future that render the purposes of this Agreement impossible to accomplish, this Agreement can only be terminated or extinguished, in whole or in part, by judicial proceedings in a court of competent jurisdiction. In addition, no such extinguishment shall affect the value of Easement Holder's interest in the *Easement Area/Property*, and if the *Easement Area/Property*, or any interest therein, is sold, exchanged or taken by power of eminent domain after such extinguishment, Easement Holder shall be entitled to receive the fair market value of the Conservation Easement at the time of such extinguishment. If such extinguishment occurs with respect to fewer than all acres of the *Easement Area/Property*, the amounts described above shall be calculated based on the actual number of acres subject to extinguishment.

12. **Condemnation.** The purposes of this Conservation Easement are presumed to be the best and most necessary public use as defined in California Code of Civil Procedure Section 1240.680 notwithstanding Code of Civil Procedure Sections 1240.690 and 1240.700. *[TEMPLATE NOTE: If Easement Holder is CDFG or another state agency, substitute the preceding sentence with the following: This Conservation Easement is a "wildlife conservation easement" acquired by an agency of the State of California, the condemnation of which is prohibited except as provided in California Fish and Game Code Section 1348.3.]*

13. **Transfer of Conservation Easement.** This Agreement may be transferred by Easement Holder upon written approval of the Third-Party Beneficiaries, which approval shall not be unreasonably withheld or delayed; provided, that Easement Holder shall give the Third-Party Beneficiaries at least sixty (60) calendar days prior written notice of the proposed assignment or transfer. Easement Holder may transfer its rights under this Agreement only to an entity or organization: (a) authorized to acquire and hold conservation easements pursuant to California Civil Code Section 815.3 and California Government Code Section 65967(c) (and any successor or other provisions then applicable), or the laws of the United States; and (b) otherwise reasonably acceptable to the Third-Party Beneficiaries. Easement Holder shall require the transferee to record the conveyance in the Official Records of the County where the *Easement Area/Property* is located. The failure of Easement Holder to perform any act provided in this section shall not impair the validity of this Agreement or limit its enforcement in any way. Any transfer under this section shall be subject to the requirements of **Section 17** below.

14. **Transfer of Easement Area/Property.** Landowner agrees to incorporate the terms of this Agreement by reference in any deed or other legal instrument by which Landowner divests itself of any interest in all or any portion of the *Easement Area/Property*, including, without limitation, a leasehold interest. Landowner further agrees to give written notice to Easement Holder and the Third-Party Beneficiaries of the intent to transfer any interest at least thirty (30) calendar days prior to the date of such transfer. Easement Holder and the Third-Party Beneficiaries shall have the right to prevent subsequent transfers in which prospective subsequent claimants or transferees are not given notice of the covenants, terms, conditions and restrictions of this Agreement. The failure of Landowner to perform any act provided in this section shall not impair the validity of this Agreement or limit its enforceability in any way. Any successor in interest of Landowner, by acceptance of a deed, lease, or other document purporting to convey an interest in the *Easement Area/Property*, shall be deemed to have consented to, reaffirmed and agreed to be bound by all of the terms, covenants, restrictions, and conditions of this Agreement.

15. **Notices.** Any notice, demand, request, consent, approval, or communication that Landowner, Easement Holder, or any Third-Party Beneficiary desires or is required to give to the others shall be in writing and be served personally or sent by recognized overnight courier that guarantees next-day delivery or by first class mail, postage fully prepaid, addressed as follows:

To Landowner: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

To Easement Holder: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Attn: \_\_\_\_\_

To Implementing Entity:  
[Santa Clara Valley Habitat Agency]  
\_\_\_\_\_  
\_\_\_\_\_  
Attn: \_\_\_\_\_

To USFWS: United States Fish and Wildlife Service  
\_\_\_\_\_  
\_\_\_\_\_  
Attn: \_\_\_\_\_

To DFG: California Department of Fish and Game  
Bay Delta Region

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7329 Silverado Trail  
Napa, CA 94558  
Attn: Regional Manager

With a copy to: Department of Fish and Game  
Office of the General Counsel  
1416 Ninth Street, 12th Floor  
Sacramento, California 95814-2090  
Attn: General Counsel

or to such other address as a party shall designate by written notice to the others. Notice shall be deemed effective upon delivery in the case of personal delivery or delivery by overnight courier or, in the case of delivery by first class mail, five (5) calendar days after deposit into the United States mail.

16. **Amendment.** This Agreement may not be amended, modified or otherwise changed in any manner, except by a written amendment executed by the parties hereto, or their successors in interest, it being understood that no easement holder or landowner will ever be obligated to negotiate or enter into any such amendment; and no discretionary approval that this Agreement may allow to be made from time to time by a party will operate to amend or modify any of the terms of this Agreement to any extent or in any manner. Any such amendment shall be subject to the prior written consent of the Third-Party Beneficiaries; any amendment made without such consent is void and without effect. Any such amendment shall be consistent with the purposes of the Conservation Easement and shall not affect the perpetual duration of the Conservation Easement. Any such amendment must refer to this Agreement by reference to its recordation data, and must be recorded in the Official Records of the County where the *Easement Area/Property* is located.

17. **Merger.** The doctrine of merger shall not operate to extinguish the Conservation Easement if the Conservation Easement and the *Easement Area/Property* become vested in the same party. If, despite this intent, the doctrine of merger applies to extinguish the Conservation Easement then, a replacement conservation easement, with a new Easement Holder identified by the Implementing Entity and approved by the Third-Party Beneficiaries, containing the same protections embodied in this Agreement shall be recorded against the *Easement Area/Property*.

18. **No Hazardous Materials Liability.** Landowner represents and warrants that, after reasonable review of Landowner's records as of the date of this Agreement, Landowner has no knowledge or notice of any Hazardous Materials (as defined below) or underground storage tanks existing, generated, treated, stored, used, released, disposed of, deposited or abandoned in, on, under, or from the *Easement Area/Property*, or transported to or from or affecting the *Easement Area/Property* [except as disclosed in the Report]. [Insert site-specific conditions, if applicable.] Landowner further represents and warrants that Landowner shall comply with all Environmental Laws (as defined below) in using the *Easement Area/Property* and that Landowner shall keep the *Easement Area/Property* free of any material environmental defect, including, without limitation,

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contamination from Hazardous Materials (as defined below). Without limiting the obligations of Landowner under this Agreement, Landowner hereby releases and agrees to indemnify, protect and hold harmless the Landowner Indemnified Parties (as defined in **Section 10(a)**) from and against any and all Claims (as defined in **Section 10(a)**) arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, or otherwise associated with the *Easement Area/Property* at any time, except any Hazardous Materials placed, disposed or released by Landowner Indemnified Parties, or their employees or agents. This release and indemnification includes, without limitation, Claims for (a) injury to or death of any person or physical damage to any *Easement Area/Property*; and (b) the violation or alleged violation of, or other failure to comply with, any Environmental Laws (as defined below). If any action or proceeding is brought against any of the Landowner Indemnified Parties by reason of any such Claim, Landowner shall, at the election of and upon written notice, defend such action or proceeding by counsel reasonably acceptable to the Landowner Indemnified Party.

Despite any contrary provision of this Agreement, the parties do not intend this Agreement to be, and this Agreement shall not be, construed such that it creates in or gives to Easement Holder or the Third Party Beneficiaries any of the following:

- (a) The obligations or liability of an "Landowner" or "operator," as those terms are defined and used in Environmental Laws (as defined below), including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. Section 9601 *et seq.*; hereinafter, "CERCLA"); or
- (b) The obligations or liabilities of a person described in 42 U.S.C. Section 9607(a)(3) or (4); or
- (c) The obligations of a responsible person under any applicable Environmental Laws; or
- (d) The right to investigate and remediate any Hazardous Materials associated with the *Easement Area/Property*; or
- (e) Any control over Landowner's ability to investigate, remove, remediate or otherwise clean up any Hazardous Materials associated with the *Easement Area/Property*.

The term "**Hazardous Materials**" includes, without limitation, (a) material that is flammable, explosive or radioactive; (b) petroleum products, including by-products and fractions thereof; and (c) hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in CERCLA, the Resource Conservation and Recovery Act of 1976 (42 U.S.C. Section 6901 *et seq.*; hereinafter "**RCRA**"); the Hazardous Materials Transportation Act (49 U.S.C. Section 6901 *et seq.*; hereinafter "**HTA**"); the Hazardous Waste Control Law (California Health & Safety Code Section 25100 *et seq.*; hereinafter "**HCL**"); the Carpenter-Presley-Tanner Hazardous Substance Account Act (California Health & Safety Code Section 25300 *et seq.*; hereinafter "**HAS**"),



and in the regulations adopted and publications promulgated pursuant to them, or any other applicable Environmental Laws now in effect or enacted after the date of this Agreement.

The term “**Environmental Laws**” includes, without limitation, CERCLA, RCRA, HTA, HCL, HSA, and any other federal, state, local or administrative agency statute, ordinance, rule, regulation, order or requirement relating to pollution, protection of human health or safety, the environment or Hazardous Materials.

19. **Representations and Warranties.** Landowner hereby makes the following representations and warranties for the benefit of Easement Holder and the Third-Party Beneficiaries:

(a) **Authority.** Landowner has good and sufficient title to the *Easement Area/Property* (including all appurtenances thereto, including, without limitation, [*all minerals and mineral rights and all water and water rights*], and Landowner has full right and authority to enter into this Agreement and convey the Conservation Easement to Easement Holder. There are no monetary liens and encumbrances recorded against the *Easement Area/Property* except as expressly identified in **Exhibit E**. All deeds of trust and mortgages recorded against the *Easement Area/Property*, or any portion thereof, are and shall continue to be subordinated to this Conservation Easement; documentation of such subordinations are contained in Exhibit E.

(b) **Compliance with Laws.** Landowner has not received notice of, and has no knowledge of, any material violation of any federal, state, county or other governmental or quasi-governmental statute, ordinance, regulation, law or administrative or judicial order with respect to the *Easement Area/Property* [*except as disclosed in the Report*]. [*Insert site-specific conditions, if applicable.*]

(c) **No Litigation.** There is no action, suit or proceeding which is pending or threatened against the *Easement Area/Property* or any portion thereof relating to or arising out of the Landownership or use of the *Easement Area/Property*, or any portion thereof, in any court or in any federal, state, county, or municipal department, commission, board, bureau, agency or other governmental instrumentality.

20. **General Provisions.**

(a) **Controlling Law.** The interpretation and performance of this Agreement shall be governed by the laws of the State of California, disregarding the conflicts of law principles of such state, and by applicable federal law.

(b) **Liberal Construction.** It is the intent of this Agreement to preserve the condition of the *Easement Area/Property* and each of the Conservation Values protected herein, notwithstanding economic or other hardship or changes in circumstances or conditions. The provisions of this Agreement shall be liberally construed to effectuate the purposes of the Conservation Easement and to allow Landowner’s use and enjoyment of the

*Easement Area/Property* to the extent consistent with such purposes. Liberal construction is expressly required for purposes of effectuating this Agreement in perpetuity, notwithstanding changed conditions of any kind. The Conservation Easement created by this Agreement is the intended best and most productive use of the *Easement Area/Property*. No remedy or election given by any provision in this Agreement shall be deemed exclusive unless so indicated, but it shall, wherever possible, be cumulative with all other remedies at law or in equity. The parties acknowledge that each party and its counsel have had the opportunity to review and revise this Agreement and that no rule of construction that ambiguities are to be resolved against the drafting party shall be employed in the interpretation of this Agreement. In the event of any conflict between the provisions of this Agreement and the provisions of any use and zoning restrictions of the State of California, the county in which the *Easement Area/Property* is located, or any other governmental entity with jurisdiction, the more restrictive provisions shall apply. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Agreement that would render the provision valid shall be favored over any interpretation that would render it invalid.

(c) **Severability.** If a court of competent jurisdiction voids or invalidates on its face any provision of this Agreement, such action shall not affect the remainder of this Agreement. If a court of competent jurisdiction voids or invalidates the application of any provision of this Agreement to a person or circumstance, such action shall not affect the application of the provision to other persons or circumstances.

(d) **Entire Agreement.** This instrument sets forth the entire agreement of the parties with respect to this Agreement and supersedes all prior discussions, negotiations, understandings, or agreements relating to this Agreement. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment in accordance with **Section 16.**

(e) **No Forfeiture.** Nothing contained herein will result in a forfeiture or reversion of Landowner's title in any respect.

(f) **Successors.** The covenants, terms, conditions, and restrictions of this Agreement shall be binding upon, and inure to the benefit of, the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall constitute a servitude running in perpetuity with the *Easement Area/Property*.

(g) **Termination of Rights and Obligations.** A party's rights and obligations under this Agreement terminate upon transfer of the party's interest in the Agreement, except that liability for acts or omissions occurring prior to transfer shall survive transfer.



(h) **Captions.** The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon its construction or interpretation.

(i) **Additional Easements.** Landowner shall not grant any additional easements, rights of way or other interests in the Property (other than a security interest that is subordinate to this Agreement), or grant or otherwise abandon or relinquish any water right or agreement relating to the Property, without first obtaining the written consent of Easement Holder and the Third-Party Beneficiaries. Easement Holder and the Third-Party Beneficiaries may withhold such consent if it determines that the proposed interest or transfer is inconsistent with the purposes of this Conservation Easement or will impair or interfere with the Conservation Values. This section shall not prohibit transfer of a fee or leasehold interest in the Property that is subject to this Agreement and complies with **Section 14**.

(i) **Recording.** Easement Holder shall record this Agreement in the Official Records of the county where the *Easement Area/Property* is located, and may re-record it at any time as Easement Holder deems necessary to preserve its rights hereunder.

(k) **Counterparts.** The parties may execute this Agreement in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

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IN WITNESS WHEREOF Landowner and Easement Holder have executed this Agreement the day and year first above written.

**LANDOWNER:**

\_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

**EASEMENT HOLDER:**

*[Santa Clara Valley Habitat Agency, a California Joint Powers Authority]*

By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

**EXHIBITS:**

- Exhibit A -- Legal Description of the *Easement Area/Property***
- Exhibit B -- Map of the *Easement Area/Property***
- Exhibit C -- Initial Conservation Values**
- Exhibit D -- Allowed Uses**
- Exhibit E -- Title Encumbrances**



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**Exhibit A**

**Legal Description of the *Easement Area/Property***



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**Exhibit B**

**Map of the *Easement Area/Property***



## Exhibit C

### Initial Conservation Values

*[In accordance with Habitat Plan Section 8.6.3, this Exhibit C will set forth those land-cover types and covered species habitat described in Habitat Plan Chapter 3 that are present on the Easement Area/Property. Section 8.6.3 also requires the Conservation Easement to either include or incorporate by reference the initial pre-acquisition assessment of covered species and natural communities present, so Exhibit C should also be prepared in a way that satisfies this requirement. by either listing covered species and natural communities consistent with those in the pre-acquisition assessment or by including an explicit cross-reference and incorporation by reference to the pre-acquisition assessment. If a complete biological inventory is available, it will be incorporated by reference in this Exhibit C.]*





**PLEASE NOTE: The following sample Agreement is provided for reference. The Department of Fish and Game updates this document as needed, and it does not necessarily contain all provisions appropriate for a given project.**

## **Exhibit D**

### **Allowed Uses**

#### ***Template Notes:***

- ***As contemplated in Habitat Plan Section 8.6.3, this Exhibit D will include a list of specific allowable uses and improvements on the Easement Area/Property that will be developed with the Landowner, customized to protect the nature and resource values of the specific Easement Area/Property while allowing, to the extent practicable, the Landowner's current and future uses of the property***
- ***If the Easement Area/Property is cultivated agricultural land, Habitat Plan Section 8.6.3 requires the conservation easement to describe the agricultural practices to be undertaken to ensure the Easement Area/Property's suitability as foraging and breeding habitat for covered species and/or as landscape linkages for native species, measures to maintain or enhance aquatic or riparian habitat, if present, and how the Easement Area/Property meets the Habitat Plan goals and objectives.***
- ***If the Easement Area/Property is currently grazed or planned to be grazed, Habitat Plan Section 8.6.3 requires the conservation easement to describe the general nature of the grazing to be allowed, specify desired vegetation and other habitat conditions. Specific guidelines or conditions for grazing will be included in the Management Plan. In addition, the following will be included in this Exhibit D:***

*Landowner shall have the right to maintain, repair, reasonably enlarge, and reasonably replace the improvements that exist on the Easement Area/Property and which are acknowledged in this Conservation Easement, in the same or different locations, provided that Landowner shall first obtain Easement Holder's and Wildlife Agencies prior written approval for any enlargement, relocation or replacement. Said approval shall not be unreasonably withheld, conditioned, or delayed but in no event shall that approval be granted if said enlargement or replacement would impair or diminish the Conservation Values of the Easement Area/Property. Notwithstanding the foregoing, (i) maintenance, repair, enlargement and replacement of improvements authorized in the Management Plan may be undertaken without additional Easement Holder or Wildlife Agency approval, and (ii) existing fences may be repaired and replaced for purposes of reasonable and customary management of livestock and wildlife, without further permission of Easement Holder or Wildlife Agencies; provided, all repair, and replacements shall be, designed and installed to protect, and not impair, the Conservation Values of the Easement Area/Property, including, but not limited to, wildlife corridors.*

WATER RESOURCES:

*Landowner may maintain such surface water resources on the Easement Area/Property as are noted in the Report as currently existing on the Easement Area/Property provided that said maintenance is consistent with the terms and conditions of this Conservation Easement and the Management Plan. Landowner may only develop new or enhance existing surface water resources with the prior written approval of Easement Holder and Wildlife Agencies which approval shall not be unreasonably withheld, conditioned, or unreasonably delayed, and then only if said development is necessary for allowed ranching operations or to enhance, restore, create, preserve, or protect the Conservation Values of this Conservation Easement, and the development does not impair the Conservation Values of this Conservation Easement and that such development is consistent with State Water Law]*

Appendix J

## **Monitoring Issues and Tools**



## Appendix J

# Monitoring Issues and Tools

Monitoring is conducted in three phases (described in Chapter 7, Section 7.2.2 *Program Phases*) and at three levels (described below). Level was a guiding principle of the conservation strategy, and goals and objectives were developed at the landscape, natural community, and species levels. This section provides an overview of what monitoring at each level involves, the issues or topics related to the three levels, and the general monitoring tools or approaches that will be used. Specific monitoring actions for each of the three levels are identified and discussed in Chapter 7, Section 7.3 *Monitoring and Management Actions*.

## J.1 Landscape Monitoring Issues and Tools

Landscape-level monitoring is directed at geographically large areas (e.g., the entire Reserve System or large portions of the Reserve System) that maintain essential ecological processes. Functioning landscapes encompass multiple ecosystems and natural communities and the movement of nutrients or materials between those units. Landscape-level monitoring addresses the following issues relevant to the Plan.

- The amount of land cover types in the Reserve System and their relationship to each other (e.g., succession or conversion from one community type to another, transitions zones between communities).
- Status and trends in the amount and quality of land cover types, natural communities, and other landscape features.
- The integrity and quality of landscape linkages and their potential role as dispersal and movement routes and corridors to preserve or maintain connectivity throughout the study area.
- The delineation of watersheds and maintenance of the general hydrologic function of those watersheds in and out of the Reserve System.
- The location, distribution, and range of invasive plants, nonnative wildlife species, and disease in the study area.
- The frequency, intensity, and geographic scope of disturbance events such as fires and floods.

The purpose of monitoring changes in the extent of land cover types within the planning area is to track long-term, landscape-level changes and, by inference,

changes to the habitats and natural communities contained therein. Long-term changes can indicate local, regional, or global problems such as unanticipated impacts of covered activities, influence of invasive species, and effects of climate change. Monitoring long-term changes will also track the contribution of the HCP/NCCP toward maintaining or improving the extent, distribution, and continuity of natural land cover types. Changes in land cover type will result from management actions (e.g., conversion of unvegetated streams to riparian woodland/forest; see Chapter 5). If landscape-level changes differ from the expected outcomes due to management actions, the Implementing Entity will attempt to identify reasons for the differences and address them through the adaptive management program as appropriate.

## J.1.1 Landscape Monitoring Issues

Following is a brief description of concepts and issues that are addressed under the topic of landscape-level monitoring. Broad issues relevant to landscape-level monitoring are discussed in this appendix. Specific monitoring actions are addressed by phase in Chapter 7, Section 7.3 *Monitoring and Management Actions*.

### Habitat Fragmentation

Since reduction of available habitat and fragmentation at a landscape level are among the principle causes of species decline, identifying and preserving key linkages is a primary objective of this Plan. The term *landscape linkage* is used in this Plan to refer to contiguous areas of habitat that connect larger areas of habitat and facilitate genetic exchange within a population or between subpopulations by allowing for movement within or between habitat patches. (For discussion on key landscape linkages and a description of acquisition targets in the study area, see Chapter 5, Section 5.3.1 *Land Acquisition and Restoration Actions*, **Table 5-6**, and **Figure 5-6**.)

In order to understand the level of stress that habitat fragmentation puts on populations of covered species it is important to understand how the existing linkages function and whether they are effective at supporting metapopulations in the Reserve System. There are two important components of monitoring landscape linkages (Bennet 2003). First, it is important to gain a basic understanding of the key linkages that occur within the study area and the representative species that utilize those linkages (status and trends monitoring). These species can serve as indicator species when determining which linkages will be protected and managed and whether they are functioning properly. It will not be possible to gain baseline information on every potential linkage, but linkages that contain landcover features representative of important types in the Reserve System (e.g., riparian corridor, grasslands, conifer woodland) will be studied. Second, it is important to monitor the effectiveness of linkages to determine whether they are achieving their goals (effects monitoring). Again, it may not be possible to monitor every linkage within the Reserve System, but

representative examples will be surveyed. In general, monitoring these linkages can take several forms.

- Regular monitoring of the occurrence and status of the plants and animals within linkages (either living there or passing through) to provide information on how the link is being used and the species for which it facilitates connectivity.
- Monitoring of individual animals within the linked system (e.g., by radiotelemetry) to obtain data on the extent, frequency, direction, and type of movement made through particular linkages.
- Monitoring the status of populations and communities in habitat connected by linkages to assess response to changes in connectivity.

Effectiveness monitoring will likely include all three of these methods at some point during the permit term. The effectiveness of linkages for wildlife species will be determined by monitoring indicator species, such as tiger salamander, bobcat, Tule elk, American badger, black-tailed deer, and mountain lion. Sampling methods will be determined upon implementation but generally will include track plates, motion-activated cameras, and transect surveys that could reveal scat or other visual evidence for terrestrial wildlife. The methods will be implemented both within linkages and in core habitat areas on either side of identified linkages.

These surveys will aid in determining whether linkages are functionally allowing passage between two points or whether enhancement of the area between two known habitat areas is necessary. Sometimes linkages will be monitored at natural pinch points, such as riparian corridors, or unnatural pinch points, such as culverts or bridges. In other cases, more rigorous monitoring could be used to determine how a given species uses the landscape. For example, radio-telemetry studies of Tule elk or American badger might be conducted. These species are grassland specialists but can range widely on the landscape, providing some insight into the overall “connectedness” of the Reserve System. There is already some general monitoring of wildlife movements occurring in the study area. These are track surveys and camera monitoring stations near underpass crossing points along U.S. 101. It is generally thought that U.S. 101 is a significant hindrance to any major wildlife movement east-west through the study area, but these recent observations are showing that movement of all sizes of mammals is occurring (T. Diamond pers. comm.) There are proposals to expand this work in scope and rigor to better understand how various species are moving through the study area and what the limiting factors are for larger carnivores (e.g., mountain lions) to persist.

## **Invasive Plants and Animals**

Invasive species control is a serious regional issue and must be evaluated at that level as well as at the site-specific level. For example, exotic plants that occur in the study area must be identified and prioritized regionally for eradication or control. To ensure Plan success, efforts to eradicate or control existing invasive



species and to prevent new invasions in the Reserve System will be coordinated with other land management agencies and private landowners in the region, as described in Chapter 5, Section 5.3.2 *Landscape Conservation and Management*.

The monitoring program will track the success of eradication and minimization efforts for invasive species through status and trends monitoring as well as through the development and execution of directed studies that evaluate the efficacy of different techniques. Depending on the resource issue and the level of the monitoring effort, this monitoring might occur at varying frequencies. For example, site-specific monitoring of nonnative plant species might be conducted annually, while a watershed-wide inventory might only occur every 5–10 years. The Implementing Entity and their consultants will take measures to reduce the spread of invasives during monitoring

## **Feral Pigs**

In some cases monitoring exotic species can be best accomplished by documenting the impact of those species on natural landscapes. It would be difficult to census the number of feral pigs within the Reserve System without an extensive effort. However, rooting disturbance can be monitored. Pig population will be controlled until rooting disturbance reaches an acceptable level. .

## **Bullfrogs and Nonnative Predatory Fish**

Following a baseline inventory of nonnative predators (e.g., fish and bullfrogs) in ponds and perennial wetlands within the Reserve System, a systematic eradication program will be implemented. Threats will be prioritized, and the progress of this program will be monitored on an annual basis by repeating the inventory on ponds that have been treated for nonnative animals and ponds that did not support nonnative animals during the initial inventory. This procedure will allow the Implementing Entity to evaluate the success of the eradication program, to detect the spread of these species to unaffected parts of the Reserve System, and to eradicate them as new invasions are identified. Ideally, sites that do not receive treatments (i.e., control sites) will be used to improve understanding of the effectiveness of eradication efforts. However, in the case of serious new infestations or highly invasive species, the management goal may be complete eradication; in such cases, control sites may not be feasible.

Similar inventory and survey efforts will occur in designated sections of riverine and riparian habitat. It is more difficult to eradicate nonnative bullfrogs and fish in riverine systems or along riparian corridors than in isolated aquatic habitats (e.g., ponds) unless the entire length of the system is treated. Monitoring nonnative animals in these habitats will focus on determining population levels. Population control efforts will reduce populations of nonnative animals to levels that facilitate the successful implementation of the conservation strategy described in Chapter 5 of this Plan and maintain those levels in designated reaches of high ecological value (e.g., critical habitat, modeled habitat, known

covered species occurrences). Monitoring the effectiveness of population control methods will entail surveys and inventory of nonnative animals but will also involve surveys of selected native species to determine the net benefit of these conservation actions. For example, population levels of native amphibians might be monitored along a reach of stream where bullfrog control has been implemented.

## Non-Native Mussels and Snails

Due to the recent discovery of the non-native zebra mussel in northern California reservoirs, a monitoring program has been enacted to determine the local source of the invasions and to identify solutions. The California Department of Fish and Game, the Department of Water Resources, and the Santa Clara Valley Water District have taken the lead on the monitoring effort. The Santa Clara Valley Water District has scheduled a visual inspection of the San Felipe Division intakes in San Luis Reservoir. This subsurface inspection will be conducted with the help of a remotely operated vehicle. The district is also working on performing subsurface inspections of other reservoirs in the study area. The goals of the monitoring are to determine if zebra mussels are present in any SCVWD reservoirs. Test plates will be installed at Calero and Anderson reservoirs and at the San Felipe Division intakes. The test plates are a Plexiglas substrate that is commonly used to detect colonies of zebra or quagga mussels. The plates will remain in the reservoirs for at least a month.

The SCVWD has formed a task force with the Alameda County Water District (ACWD) and the Zone 7 Water District in Livermore to coordinate monitoring efforts. The SCVWD has also set up an internal task force to manage the threats of both zebra and quagga mussels.

Similar efforts will need to be taken to monitor the spread of New Zealand mud snails.

## Disturbance

Within the context of this Plan, a disturbance is a temporary or intermittent change in environmental conditions that causes a pronounced change in an ecosystem. Ecological disturbances include natural events such as fire, drought, and flooding as well as nonnatural or anthropogenic events such as habitat fragmentation through development or the introduction and spread of nonnative species (Dale et al. 2001).

Monitoring will record the frequency, intensity and location of natural disturbance events, and these results will be compared to historic incidence of disturbance in an attempt to foster natural disturbance, as feasible. In general, flooding will be allowed within the Reserve System and in identified natural areas outside the Reserve System. (See the *Natural Flood Protection* section in Chapter 5.) A more detailed description of the fire-containment policy and in

instances where fires will be allowed to burn is found in Chapter 5 (*Minimum Impact Fire Suppression Techniques*).

## Disease

Disease, as defined by this Plan, is a condition leading to decreased or impaired function or increased rate of mortality in plants and wildlife; it can be caused by a variety of pathogens. Disease is a serious threat to plant and wildlife populations throughout California, including the study area, and can be detrimental to the health and function of entire ecosystems.

Disease must be carefully monitored in the Reserve System. Measures to reduce the spread of disease during monitoring activities will be taken by the Implementing Entity or its contractors. Monitoring includes identifying serious outbreaks, quantifying changes in infection rate or target diseases, and determining the impact on plant and wildlife populations, when applicable. Diseases must be identified and prioritized regionally for eradication or control when possible. Efforts to eradicate or control existing infected species and to prevent the spread of pathogens in the Reserve System will be coordinated with other land and resource management agencies in the study area and the region. In particular, monitoring diseases that affect covered and other native species will be coordinated with the Santa Clara County Division of Agriculture, the agency that monitors animals that serve as human disease vectors in the County. When feasible, large private landowners adjacent to the Reserve System will also be involved. Coordination could include sharing costs, staff, and equipment and conducting joint monitoring programs to address the regional problem of disease.

Sudden oak death (SOD), caused by the pathogen *Phytophthora ramorum*, is a serious threat to oak woodlands and mixed evergreen forests in northern California and an example of one of the diseases that will be monitored within the study area. Several species of trees in the study area have been identified as hosts to this pathogen: coast live oak, California black oak, California bay laurel, madrone, California buckeye, and big-leaf maple (Davidson et al. 2003). In addition, there are several instances of confirmed SOD near or at the border of the study area. SOD appears to be widespread along the northwestern portion of the Santa Clara County border, just outside the study area<sup>1</sup>. There is also a confirmed incidence of SOD at the border of the Almaden Quicksilver County Park. Trees near the Almaden occurrence will be monitored frequently.

Several consortiums and organizations have been formed to manage and monitor this critical issue. The California Oak Mortality Task Force—a coalition of research/educational institutions, public agencies, nonprofit organizations, and private interests including agencies such as the USDA Forest Service, the National Park Service, the California Department of Forestry, and the University of California—is focused on establishing appropriate monitoring regimes for the disease. The University of California's Center for the Assessment and Monitoring of Forest and Environmental Resources (CAMFER) is working with

<sup>1</sup> See recent maps at: <[http://nature.berkeley.edu/comtf/html/comtf\\_organization.html](http://nature.berkeley.edu/comtf/html/comtf_organization.html)>.

the California Oak Mortality Task Force and is implementing monitoring strategies at various levels. At a regional level, these organizations are combining aerial surveys with ground sampling<sup>2</sup>. At the landscape level, they are using remotely sensed data to determine the condition and pattern of trees with SOD, and at a local level, they have established research plots in various areas in Northern California that are examined every 2–3 months for various types of damage (Kelly and McPherson 2001). Monitoring efforts in the study area will be consistent with the methods used by these organizations.

## Hydrologic Function

Maintaining the hydrologic function of the study area is a primary objective of this Plan (**Objectives 1a.1, 1a.2, and 1b.1** in **Table 5-1a**). Aquatic ecosystems—including streams, rivers, ponds, and wetlands—are structured by hydrological processes operating at multiple levels.

Hydrologic function can be broadly defined as the flow of water through a landscape and the processes controlled or influenced by those flows. Hydrologic functions are driven by precipitation and include infiltration, runoff, groundwater recharge, and the quality and quantity of water within channel networks and other water bodies.

The Plan has committed to maintaining and, where feasible, improving hydrologic function within the study area, as described in detail in Chapter 5, *Conservation Strategy*. To that end, the Plan will incorporate Water District data (e.g., water level, water temperature, turbidity, stream flow, impervious surfaces, groundwater) and augment when necessary with limited additional sampling stations to be identified in the first year of implementation and functioning within two years of implementation. Water quality monitoring requirements associated with development (*Condition 3. Maintain Hydrologic Conditions and Protect Water Quality*) will also be reviewed annually by the implementing entity to ensure that the goals of the Water Quality Condition are being met and that the condition is effective.

## Impacts of Recreation

Recreation within the Reserve System will be monitored to determine if uses are having adverse effects on covered species that may be sensitive to human disturbance (e.g., San Joaquin kit fox, western pond turtle, covered plant species [**Table 4-1**]).

Monitoring will distinguish between different types of uses (e.g., hiking, horseback riding) that can have varying levels of impacts on covered species.

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<sup>2</sup> They are also using the OakMapper website <<http://kellylab.berkeley.edu/SODmonitoring/OakMapper.htm>> to submit new incidents of infection.

Monitoring will also be designed to help inform if and when seasonal or other restrictions on recreational uses will be imposed in sensitive areas (e.g., in sensitive vegetation, near ponds that support covered amphibians and reptiles).

## J.1.2 Landscape Monitoring Tools

Because most effectiveness monitoring takes place at the natural community and species levels, monitoring at the landscape level focuses on detecting changes in natural process that cannot be detected on smaller scales, such as community or species. This type of monitoring will ensure that impacts, as specified by the Plan, on biological resources are not exceeded; that preservation/enhancement, restoration and creation requirements are being implemented and met; that threats are being targeted and reduced; and that any large-scale issues affecting resources regionally are identified early and addressed. Following is a description of some of the tools that will be used to monitor status and trends at the landscape level.

### Pre-Acquisition Assessments

Information on landscape features will be collected through pre-acquisition assessment and other field surveys that provide information on the extent and distribution of land cover types in the Reserve System. These data will be used to refine currently existing species habitat models. Additionally, this information will be combined with other landscape-level information being collected by others in the region to provide resource managers, including the Implementing Entity, with an understanding of how critical biological resources are generally trending under the influence of Plan implementation as well as under the influence of other human activities and other environmental factors (e.g., fire, drought, disease). Results of pre-acquisition assessment will be merged with the results of other fieldwork to determine baseline conditions and to evaluate future changes against that baseline.

### Remote Sensing

At the landscape level, the Implementing Entity will monitor, using aerial photos or satellite imagery, the extent and distribution of Plan land cover types within the study area every 5 years. Land cover mapping will be verified in the field at sites where air photo interpretation is difficult. Current species models (**Appendix D**) reflect the landscape-level data available at the time of the writing of this Plan (December 2006). Species models will be improved as new data become available.

Additionally, landscape-level information generated through pre-acquisition assessments and other surveys will be crosschecked against periodic updates to the land cover map from aerial photos or satellite imagery described above. The Implementing Entity will coordinate landscape-level monitoring with future

regional mapping efforts that may be conducted by others within the study area (e.g., The Nature Conservancy, CDFG).

## Mapping of Invasive Plants

The goals of the Invasive Plant Control Program described in Chapter 5 are to control the spread of noxious weeds (as defined by the California Department of Food and Agriculture) and invasive exotic plants listed by the California Invasive Plant Council (California Invasive Plant Council 2007 or latest list) into new areas and to control infestations of noxious and serious weeds, where practicable. Within the Reserve System, the Implementing Entity will map occurrences of noxious weeds and invasive exotic plants as they are identified (by planning and other surveys) and periodically monitor these occurrences. The Implementing Entity will also prioritize control and removal efforts. The frequency of monitoring will depend on the threat that species pose to native biological diversity. For example, invasive plants that occur within the reserves and have the ability to spread rapidly will be monitored more frequently (e.g., several times per year). Species that spread slowly will be monitored less frequently (e.g., every 1–5 years). Additionally, Implementing Entity field staff will look for occurrences of new invasive plants that require immediate eradication or control actions within the Reserve System. Field workers will follow proper decontamination procedures prior to entering and exiting an area they are working in to stop spread of weeds, seeds, or disease between areas.

## J.2 Natural Community Monitoring Issues and Tools

The Implementing Entity will conduct monitoring to assess ecosystem and natural community function. Natural community–level monitoring focuses on local resources and threats to communities and habitats as well as the response of each natural community to management actions (especially restoration and enhancement). Natural community monitoring includes, but is not limited to, the following issues relevant to the Plan.

- The extent and quality of natural communities and the relationships between their constituent elements.
- Natural community function including the ability of these communities to withstand natural and anthropogenic stressors and threats.
- The effectiveness of the conservation measures in enhancing, creating, or restoring natural communities and their associated features (e.g., ponds, riparian woodland) and the ability of these areas to provide their intended ecological functions and values.
- The response of keystone species (i.e., species such as California ground squirrels that affect the community in greater proportion than their relative abundance) to management actions.

- Community dynamics such as grassland burrow systems.

## J.2.1 Natural Community Monitoring Issues

Following is a brief description of broad concepts and issues that are germane to natural-community-level monitoring. Specific monitoring actions are addressed by phase for each natural community in Section 7.3.2 *Natural Community–Level Actions*.

### Removal or Disturbance of Keystone Species

A keystone species is one that affects its environment disproportionately more than its abundance or biomass would suggest (Paine 1969; Power et al. 1996). An important component of natural community monitoring is the identification of any keystone species that strongly influence relationships within that community. An example of a keystone species in the study area is California ground squirrel. This species' burrows provide nesting habitat for western burrowing owl and upland refugia for California red-legged frog and California tiger salamander. In addition, California ground squirrel is an important prey item for many grassland-associated species, including the San Joaquin kit fox, which is a covered species. Accordingly, California ground squirrel is recognized as a keystone species for grasslands and will be monitored in grasslands as a measure of the effectiveness of that natural community to support the covered species that depend on ground squirrels. The effect of coyotes on red fox, as well as the effect of mountain lions on deer herbivory and raccoons on red-legged frogs and pond turtles, could also be considered keystone species. Other keystone species will be identified as the conceptual models are developed.

### Predation by Nonnative Species

Predation plays a pivotal role within many natural communities, and the presence or absence of predators can strongly influence community dynamics. While predation is often defined to include herbivory, for the purposes of this Plan, grazing is described separately below. Predation has an ecological role at the community level. Primarily, predation regulates prey populations, which in turn affects community structure. In short, the absence of natural predators can cause abnormal levels of prey populations, thereby affecting the structure and composition of the plant community. An intermediate intensity of predation is associated with high prey diversity by promoting the competitive exclusion of some prey species (Begon et al. 1996). The presence of invasive or nonnative predators can severely disrupt native prey populations that have not evolved defense mechanisms in response to those predators.

Examples of predation and its potential effect on natural communities include feral cats that affect wildlife relationships in riparian and grassland natural communities by altering the nest success of native songbirds and reducing

populations of native rodents, which in turn suppresses the prey base for many native raptors and carnivores (Begon et al. 1996). In grasslands, nonnative red foxes outcompete native foxes (e.g., San Joaquin kit fox) by reducing the prey base of native rodents (Hall 1983; Berry et al. 1987; Ralls and White 1995), which also affects native raptors. Within the study area, a potentially significant cause of red-legged frog decline is predation by nonnative bullfrogs (Lawler et al. 1999).

Nonnative species (e.g., red fox, bullfrogs and some nonnative fish) will be controlled if data indicate that the impacts from predation and/or competition on covered species or natural communities preclude the successful implementation of the conservation strategy described in Chapter 5 of this Plan. The patterns of predation between species will be examined for each natural community.

## Altered Fire Frequency

Fire is an important form of disturbance with particular relevance to chaparral, grassland, and oak woodland communities (see description of fire and its role in natural communities in Chapter 3). It is unclear how fire patterns in the study area have changed over time, and additional study is required to attempt mimicry of historic fire regimes (if feasible). In southern California the frequency of fire in shrublands is thought to be as frequent or more frequent in the twentieth century than it was in the nineteenth century (prior to fire suppression activities), partly because fire suppression activities have been ineffective at reducing fire frequency in shrublands (Keeley et al. 1999; Keeley and Fotheringham 2001). The frequency of severe weather conditions (i.e., low humidity, high winds, and drought) and the number of people with access to stands (providing an ignition source) appear to play much more important roles than do vegetation conditions in determining fire risk. Fire management is discussed in detail in Chapter 5, *Conservation Strategy*, and fire history in the study area is depicted in **Figure 10-1**.

Prescribed burning is an important tool to restore the historic patterns of fire in natural communities in the study area. It will be necessary to monitor the impacts of unplanned and prescription burns on native and nonnative vegetation within the Reserve System. Vegetation sampling to document a baseline condition for comparison will precede prescribed burning. The result of this monitoring will inform the effectiveness of burning as a tool to regenerate grassland, chaparral, and oak woodland natural communities. The purpose of burning is to reduce the biomass of nonnative vegetation while encouraging regeneration of fire-adapted native species.

## Livestock Grazing

Much of the flora of the study area evolved under the influence of prehistoric herbivores—large herds of deer (primarily a browser on shrubs and trees), elk, antelope, and other grazing animals. Grassland and in particular serpentine



grassland communities can be greatly influenced by the intensity, timing, and type of grazing (for further description see Chapter 3). At present, livestock grazing utilizing cattle, sheep, or goats is an essential vegetation management tool to maintain and improve habitat conditions for some native plants and animals and to reduce fuel loads for wildfires (see Chapter 3).

Grazing in certain native grassland communities, however, may be inappropriate or may need to be reduced to maintain or enhance these communities. Accordingly, the response of native plant populations to grazing regimes in grasslands, shrublands, or other rangelands will be monitored. Further, the response of nonnative vegetation will also be monitored to determine which grazing rotation or which combination of rotations is most effective at reducing nonnative vegetation to an acceptable level. These surveys can be supplemented with other evaluation of other natural community metrics such as percent of native shrub cover and overall species richness. Grassland songbirds can be monitored during the breeding season to measure species diversity and richness relative to each grazing regime. They can also be monitored as an effective surrogate to measuring overall grassland structure (e.g., percentage of ground cover, height of vegetation). In some grassland communities the presence of particular songbird species could be used as a surrogate for grassland health. These techniques will be explored during the targeted studies phase of implementation. Compliance monitoring will ensure that the livestock are grazing at the HCP-required levels.

## Altered Stream Flow

The diversity and abundance of aquatic organisms are shaped by six primary factors: flow regime (the pattern of water quantity over time); water quality; physical habitat (e.g., the morphology of a stream channel); food-web productivity; interactions with other species; and the connectivity between habitats, both longitudinal (upstream–downstream) and lateral (channel–floodplain). The flow regime has been called the “master variable” because it can strongly influence all the other factors (Poff et al. 1997). For example, the physical structure of a stream channel is shaped during floods as high-energy flows erode the channel and floodplain in some locations and simultaneously deposit sediment in other locations.

The flow regime is a function of watershed-level patterns of precipitation and runoff, which are strongly influenced by vegetation cover, underlying geology, and land use. For example, impervious surfaces can lead to a “flashier” runoff regime—higher peak flows and lower base flows—by reducing the amount of precipitation that infiltrates the ground. Thus, more precipitation rapidly reaches the channel network and less infiltrates into shallow groundwater to support baseflows during periods of low or no precipitation. Changes in flow regime strongly affect the quality of habitat for covered species within the aquatic and riparian land cover types and influence the structure and composition of the riverine and riparian natural communities. Because of their importance, the hydrological variables listed below will be monitored within the study area.

- **Baseflows.** Monitoring of baseflows over the entire year will ensure that sufficient water exists during critical stages of the lifecycle of target organisms (e.g., rearing of juveniles, upstream and downstream passage). SCVWD monitors stream flow releases at its reservoirs and at other stream flow gauges
- **Flooding and droughts.** In target areas, managed flooding or drybacks or processes that mimic flooding and drought will be implemented to create scour or tree mortality and to promote a variety of successional stages of riparian forest and scrub.
- **Temperature.** This important ecological variable is strongly influenced by the flow regime and impacted by changes to runoff associated with land clearing and development. Temperature measurements are already taken by SCVWD and will be supplemented by the Implementing Entity, as described earlier under *Hydrologic Function*.

## J.2.2 Natural Community Monitoring Tools

While monitoring occurs at three spatial levels, the natural communities provide the organizational framework for monitoring—species are associated with and occur within natural communities. Landscapes are made up of collections of natural communities. In this way, understanding natural communities and evaluating the effects of management on natural communities is one of the most important tasks of the monitoring program. The following sections describe approaches that will be used to monitor natural communities.

### Conceptual Ecological Models

Conceptual ecological models (conceptual models) describe the current understanding of a functioning ecosystem. They provide a framework for learning about a system and help formulate hypotheses about cause-and-effect relationships. Conceptual models are useful for management because they can represent and document uncertainty (Williams et al. 2007). They also help summarize information about a system, identify which factors may be influenced by management, and help identify critical uncertainties for targeted studies (Atkinson et al. 2004).

Conceptual models can inform the monitoring program in several important ways:

- by providing a basis from which to test assumptions about the relative importance of certain processes,
- by helping to identify threats or stressors that require monitoring,
- by identifying species or other attributes that function as indicators,
- and by serving as a repository of the changing understanding of the system as more data become available.

Conceptual models can also be used to communicate understanding of the system to other scientists and the public and to facilitate review by outside experts. Numerous studies have confirmed that the use of conceptual models greatly assists the development of monitoring and adaptive management programs (Elzinga et al. 2001).

Models can be either narrative or diagrammatic. In most cases, diagrams show the hypothesized relationships that characterize the ecosystem and are supplemented by written materials. Several types of models can be used, including stress-response models and habitat models (e.g., those developed for species accounts **Appendix D**). In one stress-response model (**Figure 7-6**), stressors and threats are aligned along the left tier of the model, the central tier displays habitat responses, and the right tier shows hypothesized responses of covered species. An example of a more complex stress-response model is shown in **Figure 7-7**.

A conceptual ecological model was developed for the Grassland habitat type (**Figure 7-8**). It provides guidance for the development of additional models and shows how that modeling process can help to elucidate assumptions and directly inform monitoring. In the inventory phase, the Implementing Entity will develop conceptual models for each natural community type. A critical task in the development of these models is the identification of uncertainties and threats or stressors. The identification of uncertainties provides a springboard for additional targeted studies. The models will also incorporate the anticipated effect of management actions on natural communities.

## Natural Community Inventory Protocols

Once a parcel for the Reserve System has been acquired, a thorough vegetation and wildlife community inventory will be conducted. The inventory will build on the results of the pre-acquisition assessment. This inventory will draw as much as possible from accepted protocols for typing vegetation communities and wildlife habitats. These typing protocols include the California Native Plant Society “Vegetation Rapid Assessment Protocol” (California Native Plant Society 2002) and “Releve Protocol” (California Native Plant Society 2003) for plants. Another option is DFG’s Keeler-Wolf “protocols.” Protocols are updated frequently and the most recent or most appropriate protocols at the time of assessment will be used. Vegetation associations and alliances will be classified and mapped in more detail than the regional land cover classification used in this Plan to provide more accurate mapping and finer units to monitor over time. Streams will be mapped and included as one of the land-cover types addressed in the inventory protocols.

Similarly, acquired parcels will be surveyed for natural communities (including covered species habitats), invasive species, and other potential disturbances. Survey protocols will be developed by the Implementing Entity during the initial phase of implementation and additional details provided in the system-wide monitoring plan. These protocols will evolve through time. Where up-to-date protocols exist for a particular species, those will be used. Such protocols will include protocols in use by any of the wildlife agencies or those developed by

scientific processes (as in the protocols developed for burrowing owls for the Burrowing Owl Consortium). Other specific protocols that may be used for wildlife include live trapping, vocalizations/recordings, mist netting, observation scans, search transects or plots, infrared camera stations, and identification and mapping of tracks and scat.

Along with the existing species models, the California Wildlife Habitat Relationships (CWHR) classification is recommended to understand the relationship between natural communities, their habitat, and wildlife species (Mayer and Laudenslayer 1988). Information from CWHR or other wildlife-habitat systems, the results of protocol-level surveys, and any other relevant, new information will be incorporated into species and community models throughout the lifetime of the Plan. When feasible, the Implementing Entity will seek to develop protocols that use a multi-species or habitat-based approach.

## Monitoring Community Function

Conserving, restoring, and managing ecosystem function is a requirement of the NCCP Act<sup>3</sup>. Often, biotic or abiotic indicators are used to assess function. In this Plan conceptual models will be used to identify attributes selected for monitoring. For example, songbirds may be monitored across terrestrial habitat types as a guide to measuring overall natural community structure and function. Bay checkerspot butterfly may provide important information regarding the health of remnant native grasslands and serpentine plant communities (Launer and Murphy 1994). This information will be used in conjunction with an understanding of drought situations and a balance with water-supply needs. Measuring vegetation, benthic invertebrates, or arthropod species diversity may also be indicators of community function. It is important to recognize that covered species monitoring is not the metric by which communities are evaluated under the Plan and that the conceptual models will guide development of monitoring for community function.

## Evaluating Creation, Enhancement, and Restoration

One of the main components of natural community monitoring will be the assessment of natural community enhancement, restoration, and creation actions. Monitoring of enhanced, created, or restored habitat will focus on the community or habitat response and, where applicable, species response. Because natural communities are likely to occur in different stable states, determining the desired restoration goals is a complex but necessary first step (Hobbs and Norton 1996). The targeted studies phase will establish a range of measures or success criteria to evaluate restoration efforts for each natural community. This monitoring will ensure that the restored natural communities are functioning as habitat for particular covered species or suites of species associated with the subject communities. **Table 7-1** lists examples of standards and objectives that may be

<sup>3</sup> California Fish and Game Code Section 2820 (a)(4)(A).

the basis for assessing success of natural community enhancement, creation, and restoration conservation actions.

Key steps to evaluate restoration and creation projects (Hobbs and Norton 1996) are listed below.

1. Identify processes leading to decline (relevant to restoration projects).
2. Develop methods to ameliorate degradation or decline (relevant to restoration projects).
3. Determine realistic goals for functional ecosystems that still result in the creation of an ecosystem with similar ecological values to local equivalents.
4. Develop relevant, easily observable success criteria.
5. Develop practical techniques for implementing these goals and ensure that they are commensurate with the problem.
6. Document and communicate these techniques.
7. Adaptively manage the system.

The Plan has accounted for the financial costs of the monitoring program and the Implementing Entity will maximize efficiencies to determine where conservation dollars are best spent. This Plan provides example success criteria for the restoration/enhancement of each natural community type (**Table 7-1**). These recommendations are preliminary and are intended to guide future efforts and provide a tangible idea of the nature of the desired criteria. More permanent criteria will be established during the first five years of Plan implementation. It is beyond the scope of this Chapter 7, *Monitoring*, and this appendix to establish the final criteria for successful management and restoration. Moreover, other conservation planning efforts that have provided too much detail too early in the process have resulted in criteria that were ill-considered and inadequate and that needed to be amended during plan implementation (B. Johnson pers. comm.). The approach used in developing this Plan strives to provide the necessary guidance for developing rigorous and defensible criteria while providing flexibility for Plan implementation and the additional work, including pilot projects that will be conducted during the early phases of the Plan.

## J.3 Species Monitoring Issues and Tools

The Implementing Entity will conduct monitoring to assess the status of covered species and to determine the extent to which the biological goals and objectives for species are being met. Species monitoring will address the following issues relevant to the Plan.

- The response of covered species to Plan conservation actions and adaptive management.
- Status and trends of covered species and other relevant species on reserve lands and in streams.

- Trends in abundance for selected indicator species over the term of the Plan.
- The response of plant populations to impacts resulting from covered activities (Condition 22).

### **J.3.1 Species-Specific Monitoring Tools**

Species monitoring will provide data for use by the Implementing Entity as well as the Wildlife Agencies, universities, and wildlife conservation organizations to assess the overall status of species populations, to identify species conservation needs, and to direct future conservation efforts. This information may also be used to redirect Plan conservation efforts in future years (e.g., reserve management prescriptions) to improve conditions on reserve lands for declining species. (Any redirection of Plan funds in response to monitoring must be carried out in accordance with the terms and conditions of the Implementing Agreement and permits, including the No Surprises assurances.)

#### **Surrogate Species**

It may be difficult to detect individuals of certain species due to small body size, rarity, or behavior. In such cases, other species can be used as surrogates for covered species that are difficult to monitor. The Implementing Entity will document the rationale for using surrogates. A more general discussion on indicator species is provided in Section 7.2.4 *Guidelines for Monitoring*.

#### **Focal Covered Species**

The status of all covered species will be monitored during the 50-year permit term. To facilitate the monitoring of covered species, a multi-species approach will be used, to the extent possible, for long-term monitoring. Focal species are defined in the literature in different ways. They can be used as indicators in landscape or community-level monitoring (Lambeck 1997) or (as in this Plan) as indicator species that are used in multi-species monitoring. In either case focal species should be sensitive to threats providing information on the suite of species with which they are associated. Focal covered species within species groups will be monitored routinely to provide the data most likely to influence the conservation strategy and to manage costs effectively. In some cases, focal covered species may be used when information on some species is highly correlated with other species, and intensively monitoring all species provides little additional information.

Species will be grouped for ease in prioritizing and standardizing survey requirements for individual species. If appropriate, sampling stations may be used to collect information on multiple species.

## Habitat Indicators for Species

Selecting the best attributes by which to measure the population status of covered species increases the effectiveness of monitoring. Monitoring adult abundance and distribution of covered species is often the most appropriate, direct measure of status. However, in many cases monitoring protocols for certain species yield variable and imprecise results or require a prohibitively expensive sampling effort. In these cases key habitat variables may be used—in conjunction with other information—to evaluate species status. This method requires targeted studies to verify the relationship between the habitat attribute and the species status and will be periodically retested to ensure that the relationship between the indirect indicator and the condition of the species does not change. See *Indicators* in Section 7.2.4 *Guidelines for Monitoring* for additional information on selection of biotic and abiotic variables. An effective monitoring program balances efficiency and cost effectiveness with the reliability of the information obtained.

## Species Models

### Species-Habitat Models

Parameters for the existing species-habitat models (**Appendix D**) will be refined and revised throughout Plan implementation as more information becomes available. At a minimum, models will incorporate any new land cover information that becomes available as part of the periodic update of GIS layer with aerial photographs or satellite imagery (every five years). Models will also be updated when new scientific or on-the-ground information that influences model outcome becomes available. If possible, species-habitat models will be developed for those species that did not have models developed for this Plan.

These species-habitat models document the best current understanding of the biological and physical parameters that influence each species and, in this way, are species-specific conceptual models. Species-habitat models were developed for most covered species using GIS to hypothesize a relationship between land cover type and other habitat associations and the distribution of covered species. These models (**Appendix D**) have served as the basis for estimating impacts and prioritizing land acquisition. Information from the pre-acquisition assessment and post-acquisition inventories will further refine these models such that they can be used to help predict distribution and occupancy and to assess population trends. Species occurrence information on Reserve Lands will also be used to update species models.

### Species Conceptual Models

As described above, conceptual models are an important component of the Monitoring and Adaptive Management Program. In addition to ecological models, conceptual models will be developed for covered species as well. The

priority of model development for each species group is defined in Section 7.3.3 *Species-Level Actions*. An example species conceptual model was developed for the California tiger salamander (**Figure 7-9**). It provides guidance for the development of additional models and shows how the modeling process can help to elucidate assumptions and directly inform monitoring. In the inventory phase, the Implementing Entity will develop conceptual models for Group 1 species. A critical task in the development of these models is the identification of uncertainties and threats or stressors. The identification of uncertainties provides a springboard for additional targeted studies. The models will also incorporate the anticipated effect of management actions on covered species.

## J.4 References Cited

### J.4.1 Printed References

- Atkinson, A. J., P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore. 2004. *Designing Monitoring Programs in an Adaptive Management Context for Multiple Species Conservation Plans*. (U.S. Geological Survey Technical Report.) Sacramento, CA: U.S. Geological Survey Western Ecological Research Center.
- Begon, M., J. L. Harper, and C. R. Townsend. 1996. *Ecology: Individual, Populations and Communities*. Malden, MA: Blackwell Sciences.
- Bennet, A. F. 2003. *Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation*. IUCN, Gland, Switzerland and Cambridge, UK. Pp. 254.
- Berry, W. H., J. H. Scrivner, T. P. O'Farrell, C. E. Harris, R. T. Kato, and P. M. McCue. 1987. *Sources and Rates of Mortality of the San Joaquin Kit Fox, Naval Petroleum Reserve #1, Kern County, California, 1980–1986*. (U.S. Dept. of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. EGG 10282-2145.)
- California Invasive Plant Council. 2007. Cal-IPC Invasive Plant Inventory (on-line database). Available: <<http://portal.cal-ipc.org/weedlist>>.
- California Native Plant Society. 2002. Relevé Protocol CNPS Vegetation Committee. Last revised: February 5, 2003. Available: <<http://www.cnps.org/archives/forms/releve.pdf>>.
- California Native Plant Society. 2003. *Vegetation Rapid Assessment Protocol CNPS Vegetation Committee*. Last revised: February 5, 2003. Available: <[http://www.cnps.org/vegetation/rapid\\_assessment\\_protocol.pdf](http://www.cnps.org/vegetation/rapid_assessment_protocol.pdf)>.
- Dale V.H., Joyce L.A., McNulty S, Neilson R.P., Ayres M.P., Flannigan M.D., Hanson P.J., Irland L.C., Lugo A.E., Peterson C.J., Simberloff D., Swanson



- F.J., Stocks B.J., Wotton M.B. 2001. Climate change and forest disturbance. *BioScience*; 51: 723–734.
- Davidson, J. M., S. Werres, M. Garbelotto, E. M. Hansen, and D. M. Rizzo. 2003. *Sudden Oak Death and Associated Diseases Caused by Phytophthora ramorum*. Plant Health Progress doi:10.1094/PHP-2003-0707-01-DG. Available: <<http://www.suddenoakdeath.org/>>.
- Elzinga, C.L, D.W. Salzer, J.W. Willoughby, and J.P. Gibbs. 2001. *Monitoring Plant and Animal Populations*. Blackwell Science, Inc., MaIden, MA.
- Hall Jr., F. A. 1983. *Status of the San Joaquin Kit Fox, Vulpes macrotis mutica, at the Bethany Wind Turbine Generating Project Site, Alameda County, California*. California Department of Fish and Game.
- Hobbs, R. J., and D. A. Norton. 1996. Towards a Conceptual Framework for Restoration Ecology. *Restoration Ecology* 4(2): 93–110.
- Keeley, J. E., and C. J. Fotheringham. 2001. Historic Fire Regime in Southern California Shrublands. *Conservation Biology* 15:1536–1548.
- Keeley, J. E., C. J. Fotheringham, and M. Morais. 1999. Reexamining Fire Suppression Impacts on Brushland Fire Regimes. *Science* 284:1829–1832.
- Kelly, M. and B. A. McPherson. 2001. Multi-Scale Approaches Taken to SOD Monitoring. *California Agriculture* 55:15–16
- Lambeck, R.J. 1997. Focal Species: A Multi-species Umbrella for Nature Conservation. *Conservation Biology* 11(4):849-856.
- Launer, A.E., and D. D.Murphy. 1994. Umbrella species and the conservation of habitat fragments: a case of a threatened butterfly and a vanishing grassland ecosystem. *Biological Conservation* 69:145–153.
- Lawler, S.P., D.D. Dritz, T. Strange, and M. Holyoak. 1999. Effects of Introduced Mosquitofish and Bullfrogs on Threatened California Red-legged Frog. *Conservation Biology*. 13(3): 613-622.
- Mayer, K.E. and W.F. Laudenslayer, Jr, eds. 1988. A Guide to Wildlife Habitats of California. State of California Resources Agency, Department of Fish and Game. Sacramento, CA. 166 pp.
- Paine, R.T. 1969. A Note on Trophic Complexity and Community Stability. *The American Naturalist*. 103(929):91–93.
- Poff, N L., J.D. Allan, M.B. Bain, J.R. Carr, K.L. Prestegard, B.D. Richter, R.E. Sparks, J.C. Stromberg. 1997. The Natural Flow Regime: A Paradigm for River Conservation and Restoration. *BioScience* 47(11).

Power, M.E., D. Tilman, J.A. Estes, B.A. Menge, W.J. Bond, L.S. Mills, G. Daily, J.C. Castilla, J. Lubchenco, and R.T. Paine. 1996. Challenges in the quest for keystones. *Bioscience* 46: 609–620.

Ralls, K., and P.J. White. 1995. Predation on San Joaquin Kit Foxes by Larger Canids. *Journal of Mammalogy* 76:723–729.

Williams, B.K., C. Szaro, and D. Shapiro. 2007. *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Adaptive Management Working Group, U.S. Washington, DC: Department of the Interior.

## **J.4.2 Personal Communications**

Diamond, Tanya. Biologist. California Department of Fish and Game. Summer–Fall 2007—various email exchanges with Troy Rahmig, Jones and Stokes.

Johnson, Brenda. California Department of Fish and Game; Habitat Conservation Planning. December 14, 2007.



Appendix K

## **California Tiger Salamander Hybridization**



# Appendix K

## California Tiger Salamander Hybridization

### Introduction

Introgression, or the incorporation of genes from one species into the gene pool of another as a result of hybridization, occurs through natural processes such as species range expansion and natural selection. It is also sometimes the result of human-related disturbance. Barred tiger salamanders (*Ambystoma tigrinum mavortium*) were introduced to California over 50 years ago and have hybridized with native California tiger salamanders (*Ambystoma californiense*). The number and range of these non-native salamanders and their hybrid progeny have expanded since introduction. This appendix summarizes the most applicable scientific literature to date and outlines the strategy to manage California tiger salamanders in the Santa Clara Valley Habitat Plan (Habitat Plan) through the adaptive management process.

To manage California tiger salamanders populations in a manner that achieves the biological goals and objectives set in the Habitat Plan, we first need to identify the potential negative impacts of hybridization and introgression. Further, we must better understand any ecological impacts that non-native and hybrid salamanders have on aquatic communities in the study area. Rather than assuming that all hybrids should be controlled, we need to determine whether a population with introduced alleles (potential variants of a gene) functions ecologically in a similar manner as the native population (Fitzpatrick et al. 2010).

The Habitat Plan will treat individuals morphologically resembling the threatened Central Distinct Population Segment of the California tiger salamander as if they were the listed entity. Take prohibitions will still apply to all individuals morphologically resembling the listed taxon. The primary reason for the initial management strategy described below is to provide the Habitat Plan with flexibility to deal with the diverse situations resulting from more than 50 years of interbreeding between *Ambystoma californiense* and *Ambystoma tigrinum mavortium* within portions of the California tiger salamander's range (Fitzpatrick and Shaffer 2004). In this case, elimination of all or even most introgressed impure populations is not likely feasible due the extent of the invasion, extent of unsurveyed habitat, longevity of the species, and biphasic life history of the species, which is predominately spent in underground burrows (Fitzpatrick and Shaffer 2007a). The hybrid management plan does not preclude the Wildlife Agencies' ability to approve, on a case by case basis, the Implementing Entity's eradication of introgressed progeny if the presence of

these individuals is determined to interfere with conservation efforts for the listed entity or other covered species.

## Release and Expansion History

Barred tiger salamanders were introduced to specific locations in California starting in the early to mid-20th century by bait dealers and fishermen, who used the larvae as live bait (Fitzpatrick and Shaffer 2007a).<sup>1</sup> This subspecies of barred salamander is native to parts of Texas, eastern New Mexico, Oklahoma, Kansas, Nebraska, eastern Wyoming, and Colorado. It has been found in isolated locations throughout much of California. The barred salamander is much larger than the California tiger salamander (it is the second largest salamander in the United States) and exhibits different behavior and life-history traits than the California tiger salamander. Native California tiger salamanders and introduced barred tiger salamanders have been hybridizing for 50–60 years (Fitzpatrick and Shaffer 2007b). Importantly, barred tiger salamander adults retain juvenile traits such as gills when they breed in aquatic habitats. These individuals, called “paedomorphs,” provide the opportunity to readily distinguish barred salamanders and hybrids from native California tiger salamanders in breeding ponds and wetlands.

Introduced and hybrid tiger salamanders in the south and east San Francisco Bay have likely dispersed there from known introduction sites in the Salinas Valley (Fitzpatrick and Shaffer 2007a). In the Salinas Valley, many sampled tiger salamanders had high frequency of introduced alleles or high hybrid index (Fitzpatrick and Shaffer 2007a). In California, an abrupt transition from high (but variable) to very low introduced allele frequencies occurs at a distance of greater than 7.5 miles (12 kilometers [km]) from release sites (Fitzpatrick and Shaffer 2007a). The Santa Clara County line is approximately 27 miles from the Salinas Valley release sites. More research is required to explain the abrupt change in allele distribution from high frequencies to very low frequencies of introduced alleles at sites greater than 12 km from release sites. One possible explanation for this observation may be the result of a strong selection for certain hybrid characteristics in local populations (e.g., hybrid survival is higher in permanent ponds) (Fitzpatrick and Shaffer 2007a). Another potential explanation is that the spread of the invasion is limited by salamander dispersal capabilities and that the “wave” of hybridization has only reached 12 km to date but continues to spread (Shaffer pers. comm. 2010).

## Santa Clara County Populations

California tiger salamander potential upland and breeding habitat is distributed throughout undeveloped areas of Santa Clara County, due to the presence of stock ponds and other aquatic habitat. Known occurrences are scattered

<sup>1</sup> The use of any salamander as bait in California and the transport or possession of any salamander in the genus *Ambystoma* is now illegal without a special DFG permit (California Department of Fish and Game 2009).

throughout Santa Clara County, on both sides of the valley, with large clusters of occurrences in Henry W. Coe State Park and Joseph D. Grant County Park (California Natural Diversity Database 2006).

Some level of hybridization is most likely present in a large number of ponds throughout Santa Clara County and may be high in some ponds in the southern portion of the county (e.g., Bluestone Lake, North Fork Pacheco Creek). Of the Santa Clara County populations genotyped, all had some low-level of hybridization (J. Johnson pers. comm. 2009), and one, Bluestone Lake, in southern Santa Clara County, had an average introduced allele frequency of 60% (Fitzpatrick et al. 2009). Three nonnative “superinvasive” alleles have been found in California tiger salamander populations as far north as the Contra Costa/Alameda County line (Fitzpatrick et al. 2009). These three genes represent only about 5% of the genes examined to date (Fitzpatrick et al. 2010). In addition to the Salinas Valley release site, barred salamanders were introduced in Santa Clara County in a perennial pond located east of North Fork Pacheco Creek in the early 1980s and in 1984 to a nearby pond that periodically dried (J. Smith pers. comm. 2010a). As a result, nonnative barred salamanders have been identified during surveys at the North Fork Pacheco Creek (above Pacheco Reservoir) (J. Smith pers. comm. 2010a). The North Fork Pacheco Creek release site is in close proximity of known California tiger salamander locations, such as those found in the southwest corner of Henry Coe Park and throughout the eastern portion of the Plan Area (Belli 2007; J. Smith pers. comm. 2010a, 2010b).

## Factors Affecting Hybridization

Hybridization between California tiger salamander and barred salamander is influenced by both environmental and biological factors. Initially, studies indicated that the survival rates of California tiger salamanders with low levels of introduced alleles may increase relative to native California tiger salamanders, due to a phenomenon called “hybrid vigor” in which cross-breeding produces higher survival rates (Fitzpatrick and Shaffer 2007b). The term “hybrid vigor,” or “heterosis” is a phenomenon where hybrid offspring have higher fitness than either of the pure parentals. For example, hybrid tiger salamanders have higher early larval survival rates (first weeks after hatching) than individuals with mostly native or mostly introduced alleles (Fitzpatrick and Shaffer 2007b).

More recent studies suggest however, that pure native California tiger salamanders are less fit than both hybrids and pure barred tiger salamanders. In a study conducted by Ryan et al., introduced barred tiger salamanders and hybrids appeared to reduce the survival, growth, and development rate of native California tiger salamanders (2009). Most contemporary hybrids in the study were larger than the native California tiger salamanders. Hybrids reduced the survival and growth rate of native California tiger salamanders through cannibalism and competition (Ryan et al. 2009).



Studies have detected a pattern of high introduced allele frequencies in perennial ponds and relatively even native and introduced allele frequencies in seasonal ponds within the introduction zone in the Salinas Valley (Fitzpatrick and Shaffer 2007a). This pattern may be due to overall selection for nonnative alleles leading to high hybrid larval survival in all ponds, particularly for barred tiger salamander characteristics in perennial ponds. Native California tiger salamanders must metamorphose into terrestrial adult salamanders (*metamorphs*) to reproduce, but barred tiger salamanders in perennial ponds often breed prior to metamorphosis, as sexually mature aquatic larval forms (*paedomorphs*) (Fitzpatrick and Shaffer 2004). Paedomorphs often reach sexual maturity earlier than metamorphs, produce larger clutches, and may breed earlier in a given season, leading to higher reproductive success in perennial ponds (Fitzpatrick and Shaffer 2007b). Paedomorphs grow larger than metamorphs, and females produce more eggs (Rose and Armentrout 1976 cited in Fitzpatrick and Shaffer 2004; Petranks 1998 cited in Fitzpatrick and Shaffer 2004). In addition, introduced barred tiger salamanders may be able to take better advantage of perennial ponds by breeding earlier in the fall, thereby giving their larvae a competitive head start over later breeding native California tiger salamanders (Fitzpatrick and Shaffer 2004). Ultimately these factors allow paedomorphs to outcompete metamorphs for the limited resources of a pond ecosystem.

## Ecological Effects of Hybridization

The presence of hybrid tiger salamanders may negatively impact native California tiger salamander population levels. As indicated above, Ryan et al. (2009) observed reduced survival and reduced growth and development rates in native California tiger salamander larvae that co-occurred with non-native salamanders and their back crossed progeny. Native tiger salamanders with slower growth rates because of hybrid salamander competition may have decreased survival in dry years (when ponds are more likely to dry before salamanders reach minimum size to metamorphose) and higher larval predation risk (Werner 1986). Native tiger salamanders with smaller sizes at metamorphosis may have lower adult fitness due to higher desiccation and predation risk (Ryan et al. 2009).

Hybrid tiger salamanders with high levels of introduced alleles have higher rates of predation on other native amphibians compared to native California tiger salamanders (Ryan et al. 2009). It is not known whether these high predation levels also occur in populations with only a few introduced alleles (Fitzpatrick et al. 2010). It has been demonstrated that the presence of hybrid tiger salamanders reduces the survival of other pond species. In one study, introduced barred tiger salamanders and hybrids reduced survival, growth and developmental rates of native California tiger salamander, California newt (*Taricha torosa*), and Pacific chorus frog (*Pseudacris regilla*) larvae (Ryan et al. 2009). California red-legged frog (*Rana draytonii draytonii*) and Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) larvae that reach a large enough size to avoid predation by native California tiger salamanders may not reach a large enough size to avoid predation by large hybrids (Ryan et al. 2009).

Only a small portion of the species' genome has been studied to date. As previously discussed, some studies suggest that hybrid tiger salamanders with low levels of introduced alleles have increased fitness and have the same general ecological traits as native tiger salamanders, although more research is required to be sure that they do not have other negative characteristics (e.g., paedomorphism) (Fitzpatrick and Shaffer 2007b; Fitzpatrick et al. 2010). Determining which non-native alleles are responsible for paedomorphism, overall size, and growth rate needs to be better understood. These physical characteristics appear to have the most significant ecological effect on the California tiger salamander (Shaffer pers. comm. 2010).

## Management of California Tiger Salamander Hybrids

### Initial Management Strategy

The Implementing Entity will adaptively manage California tiger salamanders and hybrids in close coordination with the Wildlife Agencies. Integration of the best available scientific data will be crucial in the adaptive management process as this initial management strategy is based largely upon studies targeting a small fraction of the species' genome and many more superinvasive alleles of unknown effect may have also introgressed into native populations (J. Johnson pers. comm. 2010b). Management will be updated as future studies provide us with better understanding of the functional aspects of the markers initially used to assess admixture proportions.

Rather than focusing management on genetic thresholds based on studies conducted on a relatively small portion of the species' genome, the initial management strategy will focus on restoring and maintaining wetland and pond conditions within the Reserve System that favor California tiger salamanders. Studies suggest that habitat characteristics of native species should be exploited in management strategies to limit hybridization (Riley et al. 2003). Perennial ponds studied in the hybrid zone often contained paedomorphic tiger salamanders, relative to more seasonal aquatic sites like vernal pools (Fitzpatrick and Shaffer 2004). Therefore, initial restoration actions will target sites where paedomorphs have been observed because presence of paedomorphs would indicate presence of non-native alleles in the tiger salamander population. Since different individual tiger salamanders are expected to return to breeding ponds every year, these targeted perennial ponds will be drained on an annual basis. Adaptive management will be used to determine the number of targeted ponds, evaluate effects on grazing, and the use of other available pond restoration techniques. As described in Chapter 5, ponds created for the Reserve System will be designed to rely on passive management (e.g., dry on their own periodically), minimizing the need for artificial draining and management (e.g., stock pond dams fitted with drainage structures). Annual draining of ponds may adversely affect other species covered under this Plan, such as the California red-legged frog or western pond turtle. As such, pond draining will be timed to

minimize effects on other covered species. Initially, a conservative approach may be taken to minimize adverse effects to metamorphosing California red-legged frogs (i.e., ponds should not be drained until late September). More studies would be needed to determine the amount of time paedomorphs require to fully metamorphose in order to disperse from breeding habitat to determine the efficacy of draining ponds and the timing of pond drainage.

Since the final Reserve System will be extensive and include up to 80 acres of wetlands and 104 acres of ponds (**Table 5-13**), the Implementing Entity will prioritize management sites for the purposes of California tiger salamanders unless doing so would preclude the Implementing Entity's ability to fulfill the conservation strategy for other aquatic covered species. Prioritization of management sites will take into consideration factors such as presence of paedomorphs, presence of other covered species, presence of non-native predators/competitors (i.e., fish and bullfrogs), condition of adjacent aquatic sites, and other factors.

Specific management strategies for hybrid salamanders will be incorporated in the applicable reserve unit management plans described in Chapter 5. The California tiger salamander management component of these plans will be updated as necessary to adapt to changing conditions in the reserves and to respond to monitoring or other new data. The Implementing Entity will review and, where biologically appropriate, systematically revise reserve unit management plans at least every 5 years. However, given the dynamic nature of the hybrid salamander situation, this component of the reserve unit management plan may need to be updated more frequently.

Future data may indicate that management of breeding habitat may not be adequate to fulfill the conservation strategy for the California tiger salamander. If that is the case, the Implementing Entity and Wildlife Agencies will evaluate the current management strategy and make appropriate modifications. Modifications could include active eradication of individuals based on scientifically-based genetic thresholds. Since there is a potential that the Plan may need to actively manage individuals later in the permit term, the Plan budget accounts for costs associated with genetic testing of tiger salamanders within the Reserve System, which may be necessary to substantiate future thresholds for management (see *Monitoring* below).

## Potential Management Strategy Modifications

Rather than establishing a threshold number of introduced alleles, above which an individual is considered a hybrid, it is necessary to determine whether the population with introduced alleles functions ecologically in a similar manner as the native population (Fitzpatrick et al. 2010). California tiger salamanders in Santa Clara County have been documented carrying three fixed alleles (called "superinvasive alleles") from the introduced barred salamander. If those salamanders still function in a way similar to native California tiger salamanders it may be appropriate to treat them as the native species (Fitzpatrick et al. 2010).

Currently, little is known regarding the effects of these three alleles. Researchers are proposing a set of experiments to examine these effects.

In the Salinas Valley to San Francisco Bay hybrid zone, approximately 5% (3 alleles) of genotyped native alleles have been almost completely replaced by the superinvasive alleles (Fitzpatrick et al. 2009). Since we do not yet know the morphological and ecological consequences of the fixation of introduced alleles, Fitzpatrick et al. (2009) recommend treating these the same as native California tiger salamanders.

Eradication of introduced tiger salamander alleles may not be feasible because adults may disperse over large distances and live for up to 11 years in underground burrows (Trenham et al. 2000). Further, eradication efforts under the Habitat Plan can only occur on Habitat Plan reserves. Most hybrids likely occur on private land, where access and management options are limited (Fitzpatrick and Shaffer 2007a).

Introduction of a few non-native alleles may change genetic similarity sufficiently to affect the legal status of California tiger salamander populations (Fitzpatrick et al. 2009). However, changes in morphological, ecological, or behavioral characteristics (that could potentially arise through introgression of even small amounts of genomic material may justify a change in legal status (Fitzpatrick et al. 2009; Fitzpatrick et al. 2010). For example, if future studies indicate that tiger salamanders with introduced alleles exhibit increased numbers of paedomorphs or increased predation rates on native pond species, new management actions, including eradication of hybrids, may be required to ensure that hybrids do not preclude the recovery of California tiger salamanders or adversely affect other native species.

It may therefore become necessary in the future to manage a subset of the population with allele frequencies beyond a set threshold as “not protected,” rather than verifying the genotype of each individual in the pond (Fitzpatrick and Shaffer 2007a).

The Implementing Entity will work with the Wildlife Agencies through the adaptive management process if monitoring data indicates that the initial management strategy is not adequate to meet the goals and objectives of the Plan.

## Monitoring

Hybrid index studies conducted by the University of California Davis in tiger salamander populations in California provide some baseline data for the study area. A baseline study will identify the distribution and level of hybridization in ponds and the presence of barred salamanders in the Reserve System (STUDIES-8). Baseline surveys will document presence of paedomorphs and identify non-native alleles and the frequency of those alleles present in a representative sample of salamander populations within the Reserve System. Future studies will focus

on how each non-native allele is physically expressed and the subsequent ecological impact of these alleles.

In years following baseline data collection, monitoring California tiger salamander level of hybridization will take place annually for a representative sample of wetlands and ponds within the Reserve System. Monitoring frequency could be modified with the approval of the Wildlife Agencies through the adaptive management process.

The results of monitoring will inform future management decisions made by the Implementing Entity and the Wildlife Agencies. The Plan will closely monitor the effects of this strategy on all affected covered species, not just the California tiger salamander. California red-legged frogs and western pond turtles commonly co-occur with California tiger salamanders and may be affected by habitat management proposed to address the California tiger salamander hybridization issue. Furthermore, grazing will play an important role in achieving the biological goals and objectives of many of the covered species (i.e., bay checkerspot butterfly). Draining of ponds for the benefit of California tiger salamanders has the potential of affecting the feasibility of grazing some portions of the Reserve System. If monitoring results indicate that the hybrid management strategy for California tiger salamanders is adversely affecting the conservation strategy for other covered species, the management plan will be modified through the adaptive management process with Wildlife Agency approval.

## Education and Research

The Implementing Entity will conduct education and outreach, provide technical assistance, and inform landowners of regulatory incentives (e.g., Safe Harbor Agreement) to restore, create, and maintain breeding habitat conditions on their land that favor native California tiger salamanders (POND-11). New nonnative salamander introductions are caused by humans and therefore could be decreased with a public education campaign. Public education will also be conducted to inform the public that the use of any salamander as bait in the State of California is illegal (POND-12).

The Plan will fund research to determine the distribution of, and ecological effects resulting from, introgression and interbreeding of native and non-native tiger salamanders (STUDIES-8). These studies will be coordinated with, and be complementary to, similar studies conducted outside of the purview of the Habitat Plan. With Wildlife Agency approval, the Implementing Entity will incorporate specific management prescriptions supported by this research, and research conducted by others, in the reserve unit management plans.

## References

- Belli, Joseph. 2007. The California red-legged frog in the pond of Henry W. Coe State Park, A Herpetological Survey of the Ponds of Henry W. Coe State Park. Final Report 2001–2007. Pacheco Pass Wildlife Research Station. Hollister, CA.
- California Department of Fish and Game. 2009. DFG welcomes public comment on California tiger salamander. DFG News Release. Available: <<http://www.dfg.ca.gov/news/news09/2009051802.asp>>.
- California Natural Diversity Database. 2006. California Department of Fish and Game. Updated March 31, 2006.
- Fitzpatrick, B.M. and H.B. Shaffer. 2004. Environment-dependent admixture dynamics in a tiger salamander hybrid zone. *Evolution*, 58(6):1282–1293.
- Fitzpatrick, B.M. and H.B. Shaffer. 2007a. Introduction history and habitat variation explain the landscape genetics of hybrid tiger salamanders. *Ecological Applications* 17(2):598–608.
- Fitzpatrick, B.M. and H.B. Shaffer. 2007b. Hybrid vigor between native and introduced salamanders raises new challenges for conservation. *Proceedings of the National Academy of Sciences, USA* 104:15793–15798.
- Fitzpatrick, B.M., J.R. Johnson, D.K. Kump, H.B. Shaffer, J.J. Smith, and S.R. Voss. 2009. Rapid fixation of non-native alleles revealed by genome-wide SNP analysis of hybrid tiger salamanders. *BMC Evolutionary Biology* 9: 176.
- Fitzpatrick, B.M., J.R. Johnson, K.K., Kump, J.J. Smith, S.R. Voss, and H.B. Shaffer. 2010. Rapid Spread of Invasive Genes into a Threatened Native Species. *Proceedings of the National Academy of Sciences of the United States of America*. 107(8): 3606–3610.
- Riley, S.P.D., H.B. Shaffer, S.R. Voss, and B.M. Fitzpatrick. 2003. Hybridization between a rare, native tiger salamander (*Ambystoma californiense*) and its introduced congener. *Ecological Applications* 13(5):1263–1275.
- Ryan, M.E., J.R. Johnson, and B.M. Fitzpatrick. 2009. Ecological consequences of introduced genes: Invasive tiger salamander genotypes impact native amphibians. *Proceedings of the National Academy of Sciences* 106:11166–11171.
- Shaffer, H.B., G.B. Pauly, J.C. Oliver, and P.C. Trenham. 2004. The molecular phylogenetics of endangerment: cryptic variation and historical phylogeography of the California tiger salamander, *Ambystoma californiense*. *Molecular Ecology* 13:3033–3049.

Trenham, P.C., H.B. Shaffer, W.D. Koenig and M.R. Stromberg. 2000. Life history and demographic variation in the California Tiger Salamander (*Ambystoma californiense*). *Copeia* 2000:365–377.

Werner, E.E. 1986. Amphibian metamorphosis: Growth rate, predation risk and optimal size at transformation. *American Naturalist* 128:319–341.

## Personal Communication

Johnson, J. 2009. Biologist, UC Davis, Davis, CA. Email correspondence between J. Johnson and David Johnston (California Dept. of Fish and Game), October 26, 2009.

Johnson, J. 2010a. Biologist, UC Davis, Davis, CA. Email correspondence between J. Johnson and Danielle LeFer, January 11, 2010.

Johnson, J. 2010b. Biologist, UC Davis, Davis, CA. Email correspondence between J. Johnson and Cori Mustin (USFWS), March 12, 2010.

Shaffer, H.B. 2010. Professor, UC Davis, Davis, CA. California tiger salamander hybrid discussion with the Sacramento Fish and Wildlife Office, Ventura Fish and Wildlife Office, and California Department of Fish and Game, April 7, 2010.

Smith, J. 2010a. Associate professor, San Jose State University, CA. Email correspondence between J. Smith and David Johnston (California Dept. of Fish and Game), January 27, 2010.

Smith, J. 2010b. Associate professor, San Jose State University, CA., discussion at stakeholder group meeting, January 26, 2010.

Appendix L

## **Fish Habitat Assemblage Data**





## Appendix L

# Fish Habitat Assemblage Data

## Introduction

The following section details the native and nonnative fish assemblages and in-stream aquatic habitat types throughout the major stream systems in the study area that are shown in **Figure 3-12** and described in detail in the section below. The figure illustrates the distribution of the native fish assemblages and riverine habitat types that occur in the study area.

## Fish Habitat Assemblages

To characterize the stream reaches for the purposes of the impact analysis and conservation strategy, a map was developed of native and non-native fish assemblages and aquatic habitat types throughout the major stream systems in the study area. Data was first developed to support SCVWD's Stream Maintenance Program. Dr. Jerry Smith of San José State University updated the map in July 2006 for the Science Advisors report of the Habitat Plan to reflect barrier removal and sampling results that occurred in the intervening years since the original map was created (Spencer et al. 2006). The map was then further revised and updated in 2007 by Dr. Smith and Jae Abel, a senior fisheries biologist at SCVWD. Jae Abel then adapted the map so that it corresponded to the new GIS stream data layer developed for the study area by SCVWD in early 2007. The stream categories emphasize habitat conditions for, and distribution of, steelhead trout and Chinook salmon. Ten categories were defined of fish assemblages and aquatic habitat types. These habitat categories are described as follows:

- **Estuarine.** Lowermost reaches of streams where conditions are saline and tidal (e.g., Guadalupe Slough, lower Guadalupe River, and lower Coyote Creek).
- **Cold Steelhead and Cold Steelhead—Extent Unknown.** A small portion of this habitat is on undammed tributaries, such as Tar, Bodfish, and Little Arthur creeks (tributaries of Uvas Creek); Cedar Creek (tributary of Pacheco Creek); Arroyo Aguague (tributary of Upper Penitencia Creek); and possibly the upper South Fork of Pacheco Creek. However, most of the remaining steelhead habitat in the study area is downstream of reservoirs on Los Gatos, Guadalupe, Alamos, Arroyo Calero, Coyote, Upper Penitencia, Llagas, Uvas, and Pacheco Creeks. The mapped stream segments in this category

normally provide an appropriate mix of: (1) relatively cool water (rarely above 22–24°C); (2) high stream flow to provide fast-water feeding habitat for steelhead; (3) relatively clean, coarse substrate for insect production; and (4) sufficient sun and water clarity to provide for algal growth (as a base of the food chain) and to allow steelhead to feed on drifting insects in fast water (Smith 1982, 2007; Smith and Li 1983). Much of the stream habitat in this category (downstream of reservoirs) is warmer than typical trout habitat, but the high summer stream flows, due to reservoir releases, allow steelhead to feed sufficiently on drifting insects to cope with the metabolic costs of the warmer water (Smith and Li 1983). Steelhead downstream of reservoirs in summer are found almost exclusively in fast-water habitat in riffles, runs, and heads of pools and often reach smolt size in one summer (Smith 1982, 2007; Smith and Li 1983). A variety of native fish species, including Pacific lamprey, are usually present in this habitat in upper tributaries and downstream of reservoirs.

- **Cold Trout and Cold Trout—Extent Unknown.** These are perennial habitats upstream of reservoirs where conditions are sufficiently cool to support resident rainbow trout, often with California roach, Sacramento sucker, and riffle sculpin present. Prior to reservoir construction, most of these habitats supported steelhead and possibly some salmon. Pacific lamprey is another anadromous species of concern that is presumed absent from this habitat upstream of the reservoirs. However, lampreys are able to ascend the spillway at Uvas Reservoir (Smith 1982) to utilize upper Uvas Creek. Resident trout are also present above natural and smaller artificial barriers on Smith, Bodfish, Little Arthur, and Upper Penitencia Creeks.
- **Warm Potential Trout/Steelhead.** These habitats are usually farther downstream of reservoirs than the cold steelhead reach and are often deficient in one or more of the four factors listed above for Cold Steelhead. Higher water temperatures increase steelhead food demands, often sufficiently to starve the fish. Variable year-to-year stream flows or reduced stream flows due to percolation reduce the fast-water feeding habitat that steelhead need to meet the metabolic demands of high temperature. Insect production is low due to poor substrate, turbidity, or low stream flow. Feeding is reduced by heavy shading or high turbidity. Management for increased stream flows or reduced water temperatures downstream of reservoirs in this zone may make the habitat more regularly suitable for steelhead. Often, warm-water native fish (see below) tend to dominate in this habitat type, with any juvenile steelhead scarce and/or strongly restricted to suitable fast-water feeding habitat.
- **Warm Native.** These habitats are dominated by native warm-water fishes, often including Sacramento sucker, hitch or California roach, Sacramento pikeminnow, threespine stickleback, and prickly sculpin. Most of the mapped reaches contain at least three to four of the above species as the minnow-sucker association of Smith (1982). North Fork Pacheco Creek (above the reservoir) and Upper Silver Creek (tributary of Coyote Creek) contain roach associations, dominated by California roach, with relatively scarce stickleback (Upper Silver Creek) or Sacramento sucker and prickly sculpin (North Fork Pacheco Creek). The third potential native warm-water fish community is the Sacramento perch (*Archoplites*

*interruptus*)/Sacramento blackfish community (Smith 1982). This low-gradient stream association is absent from the study area and from the rest of California because of the scarcity of Sacramento perch and the dominance of even high-quality downstream habitats by introduced fishes, including sunfishes and common carp (*Cyprinus carpio*). Foothill yellow-legged frogs and California red-legged frogs can occur in relatively undisturbed reaches of the warm native, cold steelhead, and cold trout zones.

- **Mixed Native—Salmon.** Chinook salmon currently spawn in Coyote Creek and the Guadalupe River and its tributaries. Some of the reaches they use are mapped as Cold Steelhead or Warm Potential Trout/Steelhead, indicating the higher quality year-round habitat that steelhead are potentially able to use for rearing. However, because Chinook spawn in early winter and juveniles migrate to the ocean in their first spring, Chinook are able to use habitats that turn very warm or have low water quality in summer. Most of these habitats also have a fish community composed of a mixture of native species (Sacramento sucker and hitch) and introduced species (carp and red shiner [*Cyprinella lutrensis*]).
- **Mixed Native.** These warm-water habitats contain a mixture of native and introduced species. This assemblage occurs in lower portions of Coyote and Llagas Creeks and Guadalupe River, the Pajaro River, and most pond and reservoir habitats. Native tule perch (*Hysterocarpus traski*) have apparently been reintroduced to Coyote Creek via the pipeline from San Luis Reservoir; they are present in the on-channel Ogier Ponds.
- **Managed Reservoir.** These artificial habitats provide warm-water lake conditions, a habitat type originally rare in the study area. These habitats are primarily occupied by sport fishes and other warm-water introduced species such as green sunfish, redear sunfish (*Lepomis microlophus*), pumpkinseed sunfish (*L. gibbosus*), crappie (*Pomoxis* spp.), bluegill (*Lepomis macrochirus*), largemouth bass, bullhead (*Ameiurus* spp.), white catfish (*Ameiurus catus*), and channel catfish (*Ictalurus punctatus*). Forage for the predatory fishes has usually included introduced threadfin shad (*Dorosoma petenense*), inland silverside (*Menidia beryllina*), golden shiner (*Notemigonus crysoleucas*), and crayfish. Some native fishes, including Sacramento sucker and Sacramento blackfish, can be abundant in the new habitats, but most native species do poorly when facing competition and predation from the introduced fishes.
- **Fish Scarce.** These habitats are normally dry during summer and fall. However, they may serve as migration routes for steelhead and other fishes and/or as reproductive habitat for rapidly developing amphibians such as tree frogs (*Pseudacris* [*Hyla*] *regilla*) or western toads (*Bufo boreas*).
- **No Data.** Fish species present are unknown, but may have fisheries values.
- **No Data/Probably No Value.** Fish species present are unknown, but because of location or habitat conditions the reach is unlikely to have habitat value for fish. A majority of the No Data or No Data/Probably No Value stream reaches are seasonal streams, extreme headwaters, or highly modified urban channels.

**Table 3-8** documents the relationship of the native fish communities to covered species and selected native fish.

## Habitat Plan Analysis Categories

The fish community designations were aggregated into two categories for analysis and conservation purposes related to the riverine land cover type under the Habitat Plan as follows:

- **Category 1—Fish bearing streams.** Includes all perennial and intermittent stream reaches that have sufficient flow to support cold and warm water native fisheries. Also includes all in-channel ponds and reservoirs. Also includes any Category 2 streams downstream of the Category 1 designation.
- **Category 2—Non-fish bearing streams.** All intermittent and ephemeral stream reaches that do not support native fisheries and are not downstream of reaches in Category 1. Also includes reaches with no data that likely do not support native fish. Would provide minimum protection to support water quality function under the Habitat Plan.

The stream categories (**Figure 3-12**) were derived from the fish community designations as a methodology for simplifying the impact analysis and conservation strategy while retaining the value of the underlying habitat information. This will allow for the underlying biological information to inform and guide the Habitat Plan, while allowing the categories that drive the conservation strategy and conditions on covered activities to provide maximum protection and conservation for habitats anticipated to improve during the permit term.

Canals and ditches were included in the riverine land-cover type due to their similar function to degraded streams and their very low acreage in the study area. Due to the nature of these man-made structures, canals and ditches are often managed for minimal vegetation to enhance the flow of water through the channels. However, canals that cross serpentine areas (e.g., Coyote Ridge, Santa Teresa Hills) often support several covered species including Santa Clara Valley dudleya, most beautiful jewelflower, smooth lessingia, Mt. Hamilton thistle, and California red-legged frog. Garter snakes and some ducks use canals and ditches throughout the study area.

## References

- Smith, J.J. 1982. Fishes of the Pajaro River System, *in*: Studies on the distribution and ecology of stream fishes of the Sacramento-San Joaquin drainage system, CA. P. B. Moyle (ed), *University of California Publications in Zoology* 115: 83-169.
- Smith, J.J. 2007. *Steelhead Distribution and Ecology in the Upper Pajaro River System (and stream descriptions, habitat quality ratings and limiting factors by reach for the Pajaro River and for upper Pajaro River tributaries)*. November. Revised Report to the Santa Clara Valley Water District. San José, CA. San José State University.
- Smith, J.J., and H.W. Li. 1983. Energetic factors influencing foraging tactics of juvenile steelhead trout *Salmo gairdneri*. D. L. G. Noakes, et al. (4eds.) *Predators and Prey in Fishes*. Dr. W. Junk Publishers, the Hague. pp. 173-180.
- Spencer, W. D., S. J. Barry, S. R. Beissinger, J. L. Florsheim, S. Harrison, K. A. Rose, J. J. Smith, R. R. White. 2006. *Report of Independent Science Advisors for Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP)*. December. Available: <<http://www.dfg.ca.gov/nccp/index.html>>.



Appendix M

# **Western Burrowing Owl Conservation Strategy**





# Appendix M

## Western Burrowing Owl Conservation Strategy

### M.1 Introduction

This appendix is provided as a supplement to the summary of the western burrowing owl conservation strategy in Chapter 5. The conservation strategy presented below has been constructed to offset impacts to western burrowing owl discussed in Chapter 4. Additional items relevant to the western burrowing owl conservation strategy are:

- Condition 15 in Chapter 6,
- monitoring commitments in Chapter 7,
- Stay-Ahead requirements for the burrowing owl conservation strategy in Chapter 8, and
- the burrowing owl fee in Chapter 9.

### M.2 Background

Nesting burrowing owls in the greater San Francisco Bay area and the South Bay area in particular, are a dwindling resource. In the early 1990s there were an estimated 150–170 breeding pairs in the San Francisco Bay area (DeSante and Ruhlen 1995; DeSante et al. 1997). It was estimated that these numbers represented a 53% decline from the previous census period of 1986–1990 (DeSante et al. 1997) and more recent numbers indicate that, if anything, the downward trend is increasing. In those estimates it was assumed that 75% of the San Francisco Bay area burrowing owl population occurred in Santa Clara County and nearly all of those owls were congregated around the southern edge of the San Francisco Bay (DeSante et al. 1997). Surveys in the early 1990s revealed that about a third (43–47 pairs) of Santa Clara County breeding pairs occurred inside what is now the Santa Clara Valley Habitat Plan study area (City of San José 2000).

The Plan proposes to undertake a suite of measures aimed at reversing the declining trend of the burrowing owl population in Santa Clara County. The conservation goal of the Plan, as implemented by these measures, is to establish a burrowing owl population in the permit area (the permit area includes the study

area and the extended study area for burrowing owl conservation) that is first stable, then increasing over time, while accounting for normal fluctuations in population levels. The general approach will be to increase the numbers, distribution, and connectivity of burrowing owl colonies in the permit area so that the potential for conservation success is high. This will be accomplished by using a phased conservation approach, initially focusing efforts on areas within 5 miles of an established breeding site while gathering data to inform future conservation efforts. Later phases, triggered as more resources are available and hopefully in response to initial successes, will focus on lands further out to allow for growth in both numbers and range. Initial techniques will include utilizing data gathering and analysis to inform management decisions, testing proposed management techniques and analytical approaches with scientific studies, acquisition (both permanent and temporary) of existing and potential breeding and foraging areas, management of burrowing owl habitat and, as a last resort, population augmentation techniques. These measures will be applied in four burrowing owl conservation regions, as described below.

## M.2.1 Burrowing Owl Conservation Regions

Opportunities to conduct meaningful burrowing owl conservation inside the Habitat Plan study area are limited because the most effective conservation measures must take place in near proximity to the remaining burrowing owl occurrences. Since those occurrences are clustered around the southern part of the San Francisco Bay and northern San José, there is little unused land available and that which is not built on has high land values. As a result the conservation focus for burrowing owls was expanded to include the entire South Bay region, in addition to the Habitat Plan study area (see Chapter 1, **Figure 1-2**). This *expanded study area for burrowing owl conservation* was determined following examination of movement distances of burrowing owls in the South Bay area. Movement distances have been inferred from encounters with burrowing owls that were banded at other locations in the South Bay area. The longest recorded movement of a banded burrowing owl in the South Bay area is 7.5 miles (12 km) (Harman and Barclay 2007; City of San José 2000), from the San José International Airport to National Aeronautic and Space Administration Ames/Moffett Federal Airfield (Moffett Airfield). That distance is important because it indicates a reasonable measure of dispersal distance, either for natal dispersal (birth site to nesting site) or breeding dispersal (movement between nesting locations). Planning conservation within a documented movement distance is valid to support the goal to increase the burrowing owl population and expand the distribution of burrowing owls in the South Bay area, and to proactively protect habitat that may support this expansion. For that reason, and due to the fact that most burrowing owl nest occurrences inside of the study area are on the northern edge of the study area (Barclay 2008), it was determined that conservation efforts for the burrowing owl should not be restricted to within the Habitat Plan study area, as data indicates the owls that will be the initial focus of the conservation efforts are most likely to move to the north, outside of the study area. As described in Chapter 1, take in the expanded study area will only be

authorized for burrowing owl conservation actions and not for other covered activities.

The study area has been divided into four burrowing owl conservation regions to more easily prioritize conservation actions (**Figure 5-10**). These regions are described below in order of current conservation priority.

- North San José/Baylands
- Gilroy
- Morgan Hill
- South San José

Conservation actions that will be employed to achieve the biological goals and objectives for burrowing owl will vary throughout the permit area. Generally, temporary and permanent management agreements will be put in place in the northern part of the study area and in the expanded study area. At least initially, limited habitat acquisition (permanent protection) and management will occur along the southern edge of the study area and more limited conservation activities will occur in the two middle regions because of the current lack of nesting burrowing owl colonies in these areas. If conservation actions in the North San José/Baylands region prove successful, and the number of breeding burrowing owls increases substantially, it is reasonable to assume the nesting burrowing owl population will expand into suitable habitat in the South San José, Morgan Hill, and Gilroy regions. Management of foraging and overwintering habitat will also occur on lands in the Reserve System, especially those that are dominated by grassland land covers and are located below 200 feet in elevation.

## North San José/Baylands Region

The North San José/Baylands region includes the City of San José, north and west of I-280/680, and extends around the southern margin of the San Francisco Bay to the Dumbarton Bridge (**Figure 5-10**). The remaining burrowing owl nesting colonies in the South Bay area are in this region. This region also has the greatest potential for population expansion because of its proximity to the remaining colonies. It is reasonable to assume that properly managed burrowing owl habitat in this region would be colonized (or recolonized) sooner than similar habitat in any other region.

Sites of importance for nesting burrowing owls within this region include the San José International Airport, San José/Santa Clara Water Pollution Control Plant, Mission College, the Shoreline Park and amphitheater area (Shoreline Park), Moffett Airfield, Santa Clara Valley Transportation Authority (VTA) Cerone bus maintenance yard, Tesla Plant (Fremont), Warm Springs (Fremont), and the Don Edwards San Francisco Bay National Wildlife Refuge (Don Edwards). With the exception of the VTA Cerone bus yard, none of these sites are under the jurisdiction of the Habitat Plan Permittees. Based on documented movements of burrowing owls in the South Bay area (Harman and Barclay 2007; City of San

José 2000) it is reasonable to assume that burrowing owls from any of these locations could disperse to any one of the other locations. Conservation efforts in the North San José/Baylands region will be the highest priority of the Implementing Entity because of the existing colonies and it has the greatest potential for expansion of the population.

The conservation strategy within this region will be three-fold. First, the Implementing Entity will attempt to stabilize the existing colonies to the maximum extent practicable. This will be done by acquiring land or, in circumstances where outright acquisition is not feasible but the location has significant value in the short term (i.e., San José International Airport, Shoreline Park, and Moffett Airfield), attempt to secure temporary management agreements to maintain nesting and foraging areas. Although these agreements will be temporary, they are expected to last long enough (10 years or more) to support meaningful burrowing owl management activities. Overall, the approach is to acquire or manage key lands where opportunities exist. Where acquisition is not possible, for whatever reason(s), the Plan recognizes that there may still be substantial benefit in maintaining existing breeding and foraging areas in the short term, until permanent protection can be established within the Reserve System. Therefore, use of permanent conservation easements, temporary conservation easements, or temporary management agreements on key lands may be the preferable option.

Maintaining and increasing breeding pairs in a highly altered environment such as exists around the San Francisco Bay area will require active land management, so assuring long-term management is essential for the persistence of burrowing owls in the South Bay area. Lands acquired or protected as described above will be managed to protect and enhance the owl populations. However, for sites that cannot be acquired or when acquisition is not as desirable a strategy as establishment of temporary or permanent management agreements, other approaches will be utilized. For example, at many sites in this region, public lands are, or could be, managed to support burrowing owls. At some of these sites, however, no permanent management assurances currently exist. For these sites, the Implementing Entity can carry out this strategy by providing stable, long-term funding or staffing for effective and consistent management and monitoring. With enhanced management, sites that already support breeding pairs could be improved to support more pairs. Alternatively, there may be opportunities to obtain permanent management agreements, without acquisition of the underlying land.

The second component of the conservation strategy in this region will be to attempt to increase the burrowing owl population and number of colonies within the jurisdiction of Plan Applicants. This will be done by acquiring land or securing temporary and permanent management (preferably permanent for this phase) agreements on lands that will be enhanced to attract new burrowing owl pairs. Many sites in the region may not support burrowing owls consistently because vegetation or other factors (e.g., predators) render them unsuitable. With proper management, sites within the dispersal distance of breeding locations will be managed to attract new breeding pairs.

Public lands where enhanced management may be secured to meet the Implementing Entity's population goals in this region are:

- San José International Airport (including the VHF Omnidirectional Range [VOR] communications parcel adjacent to U.S. 101);
- San Jose/Santa Clara Water Pollution Control Plant, including buffer lands;
- Alviso;
- SCVWD levees not critical for flood protection (e.g., Pond A4);
- VTA Cerone bus maintenance yard; and
- Closed landfills within San José and other cities that primarily support annual grassland. If managed properly, these areas could provide foraging habitat for burrowing owls. In some cases, California ground squirrels have recolonized these sites, providing nesting opportunities for burrowing owls as well.

Some private land may also be suitable for management agreements to help meet Plan goals.

The final component of the strategy in this region is long term and will consist of attempting to extend the burrowing owl range beyond the existing localized area. It is intended that this range expansion will lead to an increase in the overall number of burrowing owls and colonies. The primary mechanism to accomplish this goal will be to acquire, either in fee title or through permanent conservation easements, or management agreements, areas outside of currently occupied nesting habitat to accommodate the population expansion. These areas will then be enhanced to provide suitable burrowing owl habitat. Suitable sites for habitat enhancement may include, but are not limited to the following.

- Moffett Airfield.
- Don Edwards.
- City of Sunnyvale San Francisco Bay front lands (Baylands).
- City of Palo Alto Baylands.
- City of Mountain View Shoreline Park.
- Golf courses (e.g., in Santa Clara along Tasman Road)—many golf courses in the South Bay Area provide foraging and, at times, nesting habitat for burrowing owls. This often occurs around the edges of a golf course, in areas outside of the fairways, where there is more natural vegetation (i.e., the “rough”).
- Various private lands in the City of Fremont—Warm Springs District.
- Various closed landfills.
- Various Baylands in the cities of Milpitas and Fremont.

Although burrowing owl conservation actions in the sites listed above could contribute to the burrowing owl conservation strategy, not all of the locations

listed above will be eligible to be counted toward the Habitat Plan's Reserve System acquisition commitments, since protection and management in perpetuity cannot be guaranteed for most of these sites. However, the conservation strategy for this species explicitly recognizes that there can be substantial interim benefit in protecting and managing these areas for the longest period possible, in order to provide time to allow the Reserve System to be assembled and for the expansion of the burrowing owl range within the Habitat Plan Reserve System.

## Gilroy Region

This region includes the valley floor in the southern tip of the study area surrounding the City of Gilroy (**Figure 5-10**) to the Pajaro River. This region has a moderate-high potential for nesting burrowing owls because of burrowing owl occurrences near the Pajaro River. The primary conservation actions in this region will be to attract burrowing owls into the region from neighboring San Benito County, where nesting burrowing owls have been documented in low numbers during surveys in 2008 and 2009 (Barclay 2008). This will occur through acquisition of or management agreements on potential burrowing owl nesting habitat (or occupied nesting habitat if a colony is discovered) and enhancement through improved management. Currently, most of the land along the San Benito County line is managed intensively for row crops, which is generally not suitable for nesting owls although the edges of fields and uncultivated areas can provide foraging habitat.

There have been no documented nesting burrowing owls within this region since the early 1990s. Lands in this region are within the expected dispersal distance of burrowing owls nesting in northern San Benito County (Barclay 2008), so with proper management the potential exists for burrowing owls to colonize reserve lands protected in this region. There may also be opportunities to implement or improve management on public lands in the Gilroy region to attract and maintain burrowing owls. These cost-effective measures may be appropriate at the South County Water Treatment Plant in Gilroy, or other sites.

## Morgan Hill Region

This region includes the valley floor between the northern boundary of the City of Gilroy and the southern boundary of the City of San José (**Figure 5-10**). The region extends west and east to the toe of the surrounding hills. While there seems to be an abundance of burrowing owl habitat in this part of the study area no burrowing owl nests have been observed in this region since 2002 (DeSante et al. 2007; Townsend and Lenihan 2007; Barclay 2008). Before 2002, reports of nesting owls in this region were sporadic. As a result, this region has only a moderate potential to provide expansion for the burrowing owl population from the South Bay area.

During the Plan permit term, the primary purpose of burrowing owl conservation in this region will be to provide connectivity between populations in the North San José/Baylands Region and the Gilroy Region. It is hoped that burrowing owls will eventually return to this area in significant numbers. Potential nesting habitat will be acquired or placed under management agreements in this region to attract burrowing owls. When a parcel is acquired for the Reserve System that has burrowing owl habitat present, the management plan for that parcel will specify management actions that enhance the burrowing owl habitat.

## South San José Region

The South San José region includes the remainder of the City of San José south and east of I-280/680 (**Figure 5-10**). This region extends to the southern urban edge of San José and into the eastern hills. It is unknown what population levels were in this region historically, and there are currently very limited conservation opportunities in this part of the study area due to the urban environment, poor connectivity to populations that could provide colonizers and the low numbers of nesting burrowing owls in the recent past (Barclay 2008; California Natural Diversity Database 2009). Typically the number of burrowing owls in this region ranges from 0–2 adult burrowing owls. During surveys conducted from 2008–2009, one nesting pair was observed (on vacant land next to Meadowfair Park).

Expected impacts to occupied nesting burrowing owl habitat will be low or absent from this region because few, if any, nesting owls remain.

The primary goal of burrowing owl conservation in the South San José Region is to provide stepping-stone connectivity between the North San José/Baylands region, and the Morgan Hill region. The functionality of any connectivity through this area is constrained because it is mostly a highly urbanized environment. Due to the limited amount of suitable habitat and the isolation of existing habitat patches the Implementing Entity will not only pursue land acquisition in this region to secure conservation but will also attempt to reach permanent or temporary management agreements with public or private landowners to retain suitable habitat for burrowing owls.

### M.2.2 Population Performance

As part of the process to determine a viable conservation plan for burrowing owls in the Plan, it was decided to utilize a count-based population viability analysis (PVA) to determine the probability of persistence of three burrowing owl nest colonies in the South Bay (**Appendix N**). This analysis was completed on the three largest remaining burrowing owl colonies in the South Bay area: Moffett Airfield, San José International Airport, and Shoreline Park using survey data of adult burrowing owls from the 11-year period, 1999–2009. These sites were chosen because they are the primary remaining population clusters and because



data was available for the period of time recommended for the analysis (i.e., at least 10 years). The intent of the analysis was to quantify population size, trend, growth rate, and variance in the three burrowing owl colonies and to evaluate the probability of persistence of these colonies (individually and combined) during that 11-year period. Using those data, a PVA was generated to estimate the risk of future extinction based on the behavior of the data during the 11-year period. It is assumed that changes in population performance at these three colonies are indicators of changes that could occur in the South Bay burrowing owl nesting population as a whole if it were under more of a managed condition. Therefore, the population performance at these three sites can be used as an index for population performance for burrowing owls in the Habitat Plan study area.

All three colonies showed declining population trends during the 11-year period from 1999–2009. The colonies at San José International Airport and Moffett Airfield showed very similar magnitudes and variance of decline, while Shoreline Park showed an even greater magnitude and variance of decline. The PVA model predicts similar probabilities of extirpation for the colonies at San José International Airport and Moffett Airfield, while Shoreline Park reflects an even higher probability.

The standard that was used to represent effective extirpation is the probability of reaching a quasi-extinction threshold of two adult owls. Quasi-extinction in this case is defined as the point at which the breeding colony becomes essentially non-functional (two adults). San José International Airport and Moffett Airfield showed similar probabilities of quasi-extinction, with an unacceptably high chance of extinction (95%) by Year 22. Shoreline Park showed a probability of reaching the quasi-extinction threshold of two adults, with an unacceptably high<sup>1</sup> chance of extinction (95%) by Year 10. This is likely due to the smaller size of this colony. The probability of quasi-extinction for the combined populations was set at six adults for all three colonies (representing two adults at each colony). The combined sites had an unacceptably high chance of extinction (95%) by Year 18. See **Appendix N** for more details on the methods and results of this analysis.

## Population Size

In order to develop a burrowing owl population size goal for the Habitat Plan, the annual population size of adult owls was artificially increased in a statistical model to determine the rate at which the numbers of adult burrowing owls at the three baseline colonies (San José International Airport, Moffett Airfield, and Shoreline Park) would need to increase and over what period of time to change the PVA probability of extinction trend from a negative growth rate to a positive growth rate. It was determined that if currently measured population characteristics held true (i.e., growth rate and variance were constant) changing the overall number of adult burrowing owls in this type of model did not change

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<sup>1</sup> The point at which probability of quasi-extinction reaches an “unacceptably high” level is described in the PVA (**Appendix N**).

the probability of persistence significantly (**Appendix N**). Instead, changing the growth rate from negative to positive required an incremental, annual, steady increase in the number of adult burrowing owls over a number of years. Therefore, for the purposes of this Plan, growth rate is a more correct predictor of persistence than an ultimate population size.

The most recent survey year that was considered in the PVA was 2009. During that year there were 51 adult burrowing owls observed at the three nest colonies under study. This analysis focuses on the number of adult burrowing owls rather than breeding pairs or juveniles (for a complete discussion of this see **Appendix N**). In order to change the population trend at the three colonies from negative to positive, within a 10-year time period there would have to be an increase of three adult owls per year combined at the three sites. Based on the data set used in the PVA, quasi-extinction at the three PVA colonies would occur in 18 years. By setting population growth goals that would change the growth rate from negative to positive by Year 15, the strategy aims to avoid a situation where the South Bay burrowing owl population gets too low to recover. A period of at least 10 years is also needed to allow time for collection of data at occupied nest sites in the permit area and integration of that data into the PVA model.

## M.3 Biological Goals and Objectives

The primary goal of the conservation strategy is to increase the size and sustainability of the breeding population and increase the distribution of breeding and wintering burrowing owls in the study area and the expanded burrowing owl conservation area. The PVA demonstrates that the overall number of adult burrowing owls in the South Bay area is less important than the trend in population numbers and the variability in the number of owls from year to year. An unsurprising conclusion is that a growing or stable population is more likely to persist than a widely fluctuating population.

Based on this conclusion, the Implementing Entity will establish a positive growth trend in the permit area by Year 15 of the permit term and maintain the overall positive growth trend thereafter; manage 5,300 acres of modeled occupied and potential nesting habitat in the permit area; and protect and manage 21,310 acres of modeled overwintering habitat (**Figure 5-10**). This will be accomplished by targeting protection and management of grassland or barren land (as described in Chapter 3 and shown in **Figure 3-10**) with less than 25% slope in tracts that meet minimum species spatial requirements. When considering the recovery of the burrowing owl in the Habitat Plan permit area, the ultimate regional goal is to have a burrowing owl population determined by the PVA to be stable. In practical terms, we define this goal as being met by achieving a positive growth rate by Year 15 of the Plan using annual data collected from active nesting colonies in the South Bay area for which adequate data is available and determined to be stable enough to not artificially skew the results. Year 15 was chosen to allow adequate time for the conservation actions

to have a measureable effect and to provide a buffer on the 10-year goal discussed above. In addition, if counts of adult burrowing owls begin in Year 1 of implementation, those data cannot reliably be used in a PVA until Year 10 of implementation. Setting the goal of achieving a positive growth rate by Year 15 allows for the inclusion of sites in the South Bay area be incorporated into a PVA analysis, and apply an adaptive management approach if it is discovered that positive results are not being reached at Year 10.

The most likely way to achieve the Year 15 positive growth rate will through an average increase in the number of adult burrowing owls at San José International Airport, Moffett Airfield, and Shoreline Park each year during the Year 15 time period. These three sites are the focus because there was enough data (recommended 10 years) at each site to perform a PVA. Continuing to track the number of adult burrowing owls at each of these locations will give the Implementing Entity the most accurate assessment of how the burrowing owl population is performing and whether the goals for the number of adult burrowing owls is being met each year. Additional data will be collected annually at VTA Cerone bus yard, the San Jose/Santa Clara Water Pollution Control Plant buffer lands, and any other nest sites found during Plan implementation, but that data will not be useful for assessment using a PVA until ten years of data is collected at the site.

In addition to monitoring population changes in adult owls, the Implementing Entity will enhance grassland or barren land (as described in Chapter 3 and shown in **Figure 3-10**) on which management agreements have been placed and on Reserve System lands that are flat or moderate slopes (<25%). In order to increase the chance that the sites will be used by owls, areas will be targeted within 5 miles of an established breeding site in the permit area (i.e., San José International Airport, Reid Hill View Airport, San Jose/Santa Clara Water Pollution Control Plant buffer lands). Acquisition, enhancement, and restoration conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), valley oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), and seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*) are intended to benefit western burrowing owl through breeding and foraging habitat conservation and management.

An adaptive management approach for determining what types of conservation actions will be employed and where conservation funds will be spent is critical since management activities are likely to change often, due to rapidly changing circumstances, both negative and positive. Depending on a number of factors, the priorities for conservation monies may shift (see *Setting Conservation Priorities*, below). Priorities may also shift through the adaptive management process if additional colonies are discovered during the permit term.

In order to achieve Plan goals during the permit term the Implementing Entity will carry out the following generalized conservation actions.

1. Protect existing colonies through fee title acquisition, purchase of a conservation easement, or other management agreements (San José

International Airport, Moffett Airfield, Shoreline Park and others, known or unknown), managing the sites for long-term nest viability.

2. Protect foraging habitat, through fee title acquisition, purchase of conservation easements, or other management agreements (San José International Airport, Moffett Airfield, Shoreline Park and others, known or unknown), ensuring proper burrowing owl management on those sites.
3. Protect through fee title acquisition, purchase of a conservation easement, or other management agreements, currently unoccupied areas that have potential nesting habitat and are within the expected dispersal distance of nesting burrowing owls.
4. Protect through fee title acquisition, purchase of a conservation easement, or other management agreements, locations outside of the 7.5-mile dispersal distance in anticipation that these lands will be needed in the future for nesting, foraging, and connectivity between colonies as the burrowing owl population expands beyond its current distribution.
5. Carry out data collection, analysis and controlled experiments to ensure the most appropriate techniques will be used and are being used.
6. Manage habitat areas that may support burrowing owls.
7. If the conservation strategy is implemented as planned but the number of adult burrowing owls fails to meet the annual increase of at least three adult owls each year at the annual survey sites described in Section 7.3.3 *Species Level Actions* subheading *Western Burrowing Owl (Group 1)* the Implementing Entity will propose more active conservation methods to the Wildlife Agencies, such as population augmentation to provide a boost to local population numbers. Active methods utilized will be supported by data gained from pilot studies. Any changes to the conservation strategy (i.e., adaptive management) must be approved by the Wildlife Agencies prior to implementation.

The specific burrowing owl conservation plan is comprised of conservation actions that are grouped into three “tiers” of priority. Each tier is discussed in detail below but generally consists of:

- **Tier 1 conservation actions** are designed to stabilize the existing population by protecting and/or managing occupied burrowing owl nesting habitat. Tier 1 actions may indirectly increase the numbers of owls in extant colonies. Tier 1 conservation actions will take place initially in the North San José/Baylands Region where owls currently occur. Tier 1 conservation actions will occur immediately.
- **Tier 2 conservation actions** are designed to facilitate growth and expansion of existing colonies, the number of colonies, and the range of the species in the permit area by protecting and managing potential burrowing owl nesting habitat in all portions of the permit area. Tier 2 conservation actions will also take place immediately and initially in the North San José/Baylands Region where owls currently occur.

- **Tier 3 conservation actions** consist of more experimental and active methodologies such as population augmentation and owl relocation within the permit area to increase owl numbers and expand distribution. Tier 3 actions will be implemented in response to population performance at the three index sites (Shoreline Park, San José International Airport, and Moffett Airfield) but these actions could occur in any of the burrowing owl conservation regions. These actions will be coordinated with the Wildlife Agencies and will only be implemented upon their approval.

Funds collected for burrowing owl conservation actions related to occupied and potential nesting habitat come from the Habitat Plan land cover fee and the burrowing owl fee. It is anticipated that funds will be obtained from other sources, such as non-profits and State and Federal grants, to augment specific conservation actions, including research efforts. The land cover fees will support acquisition and management of land in the Reserve System which will assist with all three tiers of conservation. The burrowing owl fee will be used to complete conservation actions in all three tiers as well, but if the population trend is downward, use of the burrowing owl fee could shift as described below. The types of conservation actions that burrowing owl fee funds will be used for will depend on the conservation need at the time the accumulated funds are spent, and may include activities in all tiers. However, in the short-term<sup>2</sup>, funds collected from the burrowing owl fee will be used for two purposes: protection and management of occupied burrowing owl habitat (Tier 1), and data collection (e.g., annual surveys).

Through the course of the permit term these three tiers of conservation actions may occur in any of the four burrowing owl conservation regions. Initially, Tier 1 conservation actions will only occur in the North San José/Baylands region because occupied burrowing owl nesting habitat currently only occurs in this region. Should burrowing owls begin to nest consistently in other regions of the permit area, Tier 1 conservation actions may occur in those areas as well. Tier 2 conservation activities will occur throughout the permit area, in all four burrowing owl conservation regions because potential burrowing owl nesting habitat occurs in all four regions. Initially, Tier 3 conservation activities will only occur in the North San José/Baylands region since this is where existing nest colonies occur, and there is the greatest potential for effective implementation of these measures, should they become necessary. Tier 3 conservation actions may also occur in other regions later in the permit term if nesting burrowing owls establish there on their own.

## **M.3.1 Setting Conservation Priorities**

The Implementing Entity will determine how burrowing owl conservation funding will be allocated. Acquisition in fee title or conservation easement will always be the preferred strategy. However, given the unique circumstances for

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<sup>2</sup> Until at least two annual surveys (one to establish the baseline and one year to determine whether or not the population is increasing by three birds per year) have been completed.

the burrowing owl, the conservation strategy for the burrowing owl includes more flexibility than is provided for the conservation strategy for other covered species. The default assumption is that funds generated from the burrowing owl fee will be used to acquire and manage occupied and potential burrowing owl nesting habitat in the South Bay area through fee title, conservation easements, or management agreements. Other funding sources may also be used for this purpose, but monies from the burrowing owl fee will be earmarked for this purpose, as well as for other burrowing owl conservation actions. The selection criteria for how acquired or managed parcels will be chosen are discussed below (see Section M.4.3). Burrowing owl fees will be used wholly to acquire and manage occupied or potential nesting habitat, as long as the PVA population curve indicates a positive growth. During the first 10 years, this will be assumed to be occurring as long as there is sufficient annual increase of at least three adult owls per year cumulatively at the annual survey sites (e.g., Moffett Airfield, Shoreline, San José Airport, VTA Cerone bus yard, and San Jose/Santa Clara Water Pollution Control Plant buffer lands). During the first 10 years, burrowing owls will be surveyed inside the permit area to begin to build a dataset that can be used in a PVA for the South Bay population starting in Year 10. From that point forward the PVA will be based on all sites surveyed in the South Bay area, both inside and outside of the permit area, for which sufficient data exists. This will give the most accurate picture of population viability in the South Bay and will better inform whether the conservation strategy is working. Conservation action prioritization will be based on available funding and the numbers predicted by the PVA model necessary to achieve positive growth.

The first year of annual surveys will determine the baseline population of burrowing owls in the permit area. If during Plan implementation the cumulative annual growth rate is below the three-owl threshold at the annual survey sites, or after more colonies are added to the model, below whatever number of owls is predicted by the model to achieve positive growth, then 50% of the revenue generated from the burrowing owl fee will be shifted from Tier 1 and 2 conservation actions to Tier 3 conservation actions. The decision about funding allocation for Tier 1 and 2 conservation actions versus Tier 3 conservation actions will be made following the annual survey that begins during the second full year of Plan implementation. The numbers of adult burrowing owls annually at the three index sites will be compared to the number of adult burrowing owls observed at the three sites during the first full year of implementation. Following the assessment during year two, the change in the number of adult burrowing owls at the three sites will be documented annually and the trend recorded. If the goal of an increase of at least three adult burrowing owls is not being met, then the money collected from burrowing owl fee will be split 50/50, between Tier 1 and 2 vs. Tier 3 conservation actions.

## **M.3.2 Burrowing Owl Conservation Priorities**

### **Tier 1 Conservation Actions**

1. Protect and manage occupied burrowing owl nesting habitat (an active nest and foraging lands within 0.5 mile of the active nest).

In order to identify occupied nesting habitat, the Implementing Entity will coordinate annually with survey efforts conducted at known nesting sites in the permit area including surveys conducted at San José International Airport, Moffett Federal Airfield, Shoreline at Mountain View, VTA Cerone bus maintenance yard, and San Jose/Santa Clara Water Pollution Control Plant buffer lands. Additional locations will be surveyed in subsequent years as new colonies are formed or discovered over the permit term. The Implementing Entity will coordinate with survey staff at the first three locations to obtain data from ongoing annual survey efforts and will provide guidance on the survey information required to inform regional data collection. The Implementing Entity will be responsible for conducting surveys at the last two locations (and any new colonies that may be discovered during the permit term) and will use the same methodology across sites to ensure consistency. All surveys will be conducted consistent with California Burrowing Owl Consortium methodology (California Burrowing Owl Consortium 1993). Data collected from the annual survey sites will be used to track the number of adult burrowing owls and to assess reproductive status. Information will contribute to a rolling population viability analysis in the region. Collectively, the data will inform the adaptive management of this species and will help prioritize use of funds for burrowing owl conservation under the Plan. The first annual survey will occur during the first full year of Plan implementation and each year thereafter.

The protection of occupied and potential nesting habitat will be tracked in the same manner as other land cover types, discussed in Section 8.6.1, to ensure that impacts are occurring in rough step with habitat goals based on the necessary population increase to allow for recovery.

2. Increase survival rates at existing nest colonies through one or more management actions including, but not limited to:
  - a. protection of nests by controlling access and maintaining fencing,
  - b. predator control,
  - c. habitat management to increase prey availability,
  - d. cessation of inappropriate rodent control (e.g., application of rodenticides, hunting, or trapping) on-site and/or implementation of activities that would enhance burrowing mammals.
3. Where feasible, fund management activities on the three index sites (San José International Airport, Moffett Airfield and Shoreline) to benefit burrowing owls.

## Tier 2 Conservation Actions

Tier 2 conservation actions will be initiated during the first year of implementation. These actions will require several years to complete and will be initiated upon Plan implementation.

1. During the first 3 years of implementation, survey all undeveloped parcels within 7.5-miles of documented nest colonies in the North San José/Baylands Region and complete an opportunities and constraints assessment of each, relative to the potential of the parcel to function as a burrowing owl reserve in the future. Assign parcels a high, medium, or low priority for burrowing owl conservation.
  - a. High: parcel with documented nesting burrowing owls in the previous 3 years and grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows. Existing landowners willing to enter into management agreements and current land uses that are compatible with burrowing owl habitat requirements would be ranked higher than those that do not meet these criteria.
  - b. Medium: parcel with no history of burrowing owl occupancy but with grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows.
  - c. Low: parcel with grassland or barren land cover type that can be managed (vegetation height) to be favorable to burrowing owl but lacks ground squirrels or other suitable nesting burrows.
2. The Implementing Entity will also coordinate with other South Bay local governments, special districts, and non-profit organizations every 3 years to assess status of the burrowing owl population in the study area and the expanded study area for burrowing owl conservation. These survey efforts are aimed at identifying occupied and potential burrowing owl habitat in the four burrowing owl conservation regions. The focus of this larger survey effort is to document population expansion into new areas. This 3-year survey will help determine whether the range of nesting burrowing owls in the study area and expanded study area for burrowing owl conservation is stable and, possibly, expanding. Analysis of the survey results will encompass the areas surveyed annually, areas with historical or recent occurrences of nesting burrowing owls, and areas with highly suitable habitat that has not been occupied in the past.
3. Protect and/or manage potential or occupied burrowing owl nesting habitat as described above.
4. Conduct two meetings annually of burrowing owl survey partners. The first meeting will be in January, prior to the burrowing owl nesting season to coordinate with surveyors and ensure that all appropriate locations are surveyed. The second meeting would be in September, following the



burrowing owl nesting season, to gather data from surveyors and discuss potential changes in survey protocols.

## **Tier 3 Conservation Actions**

1. With Wildlife Agency approval, implement a program to increase reproductive success of burrowing owls in the South Bay area. General success criteria for the program will be defined in close coordination with the Wildlife Agencies and set prior to its implementation, during the surveys described in Tier 2, and based on the success or failure of the program, interim checkpoints will be established to determine if/when the program should cease.
2. Study the feasibility of population augmentation activities including the following.
  - a. Initiate a pilot reintroduction program and study the success of the effort and the feasibility of replicating the effort elsewhere. Potential locations for a pilot study include, but are not limited to:
    - 1) San José International Airport VOR site (radio tower),
    - 2) fenced portion of San Jose/Santa Clara Water Pollution Control Plan buffer lands,
    - 3) fenced portion of Don Edwards,
    - 4) existing burrowing owl mitigation area in the City of Santa Clara at the end of Great America Parkway, and
    - 5) Parts of Shoreline Park designated burrowing owl habitat under an approved Burrowing Owl Management Plan.
  - b. Initiate a pilot study to determine other methods to increase reproduction of local burrowing owls. These methods may include but are not limited to:
    - 1) protect nest sites to reduce predation on eggs and young,
    - 2) supplemental feeding of nesting females and young,
    - 3) forced re-nesting or double-clutching of owls in captivity, and
    - 4) foster nestlings to maximize brood size.

If studies have not been completed to justify the use of one or more of these techniques, then funds shifted to Tier 3 will be used first to plan and complete those studies.

## **M.4 Habitat Management and Enhancement**

### **M.4.1 Occupied and Potential Nesting Habitat**

The Plan assumes that 5,300 acres of occupied and potential nesting habitat will be managed for the conservation strategy. This land may be acquired in fee title or conservation easement, or it may be managed under temporary or permanent management agreements. At a minimum, 600 acres of the 5,300 acres must be protected under a conservation easement as part of the Reserve System, and this 600 acres must be occupied nesting habitat.

#### **Assumptions for Calculating Amount of Conservation Needed**

1. In order for the South Bay burrowing owl population to be stable or increasing, an additional three owls (1.5 breeding pair) will need to be recruited into the population each year.
2. A breeding location (nest) requires a minimum of 140 acres of foraging habitat surrounding the nest site. If an additional 1.5 breeding pairs are recruited into the local population each year an additional 210 acres ( $1.5 \times 140 = 210$ ) would need to be managed each year to support that expansion.
3. Many of the areas where conservation opportunities exist are already owned and managed by Permittees. It is assumed that some conservation actions will occur on those lands to benefit burrowing owls outside of the Plan requirements. As such, the acres of new lands that will be acquired or put under management agreements was reduced by 15%.
4. Owls from multiple nest sites use the same foraging habitat (i.e., breeding territories overlap). The total estimate of land that needs to be acquired and/or managed for burrowing owl population growth has been reduced by 20% to account for this overlap in foraging habitat.
5. Utilizing survey data from 2009 the number of adult burrowing owls for Shoreline Park (6), Moffett Airfield (26), and San José International Airport (19) was 51 adult burrowing owls. An additional 19 burrowing owls were observed during surveys in 2008 in other parts of the Habitat Plan study area. This total of 70 adult burrowing owls in the South Bay area is a good estimate of the baseline number of adult burrowing owl in the South Bay area. Of those 70 owls, 38 (or 54%) were inside of the Habitat Plan study area.
6. It is assumed that even though 54% of the burrowing owl population currently resides inside the Habitat Plan study area, the Habitat Plan conservation strategy will address the habitat needs of 70% of the population going forward. This additional commitment is an acknowledgement of habitat lost in the north San José area in the past and demonstrates a

commitment to recovering the species in the South Bay area during the permit term.

7. If three burrowing owls (1.5 breeding pair) are recruited to the population each year, a total of 220 (70 baseline+150 new) would be attained over the 50-year permit term. Based on a commitment to support 70% of the habitat needed for a successful South Bay burrowing owl population, 154 (70% of 220) adult burrowing owls would be supported by lands managed by the Implementing Entity by the end of the permit term. Therefore adding 116 owls (154 total – 38 baseline) would be the responsibility of the Implementing Entity. Those additional 116 adult burrowing owls (58 breeding pair) would require 140 acres of foraging habitat per pair, for a total of 8,120 acres.
8. The 8,120 acre requirement would be reduced by 15% (see number 3 above) to give credit for additional conservation actions and by 20% (see number 4 above) to account for overlapping foraging habitat between breeding pairs  $(8,120 - (8,120 * 15\%) - (8,120 * 20\%) = 5,278$  acres which is rounded to a 5,300-acre commitment in the Habitat Plan).

## Nesting Habitat Acquisition and Management

Based on these assumptions, the Implementing Entity will manage a minimum of 5,300 acres for the western burrowing owl nesting habitat (occupied and potential) by Year 45. Of this acreage, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement. For the remaining 4,700 acres, land acquisition (fee title or easement) or management agreements may be used. The Implementing Entity will prioritize land acquisition over management agreements. All 5,300 acres of western burrowing owl nesting habitat will be acquired or under a permanent management agreement by Year 45.

Management agreements may be used in place of land acquisition on up to 4,700 acres, if the specified regional targets cannot be met through land acquisition. During the permit term, temporary management agreements may be put into place rather than permanent management agreements. Temporary management agreements (e.g., 10–20 year agreements as opposed to agreements in perpetuity) may be used to protect nesting habitat on areas not immediately planned for development as long as the amount of land permanently protected in fee title or conservation easement is consistent with the Stay-Ahead provision (Chapter 8, Section 8.6.1 *Stay-Ahead Provision*, subheading *Rough Proportionality and Stay-Ahead for the Burrowing Owl Conservation Strategy*). By Year 45 of the permit term, all management agreements must be permanent.

The management agreements must be legally binding documents to which the Wildlife Agencies are parties. Their establishment will follow a process similar to land acquisition described in Chapter 8, Section 8.6 *Land Acquisition*. The management agreements will be consistent with the land acquisition process; however, the Implementing Entity would work with the land owner to establish

the management agreement rather than acquiring the land in fee title or with a conservation easement. The duration and management requirements will be agreed upon by all parties and specified in the management agreement document. For the permanent management agreements, management must be assured in perpetuity. For temporary management agreements, management must be assured for the duration of the agreement. As parties to the management agreements, the Wildlife Agencies will have review and approval authority.

The opportunities for burrowing owl conservation are discussed for each burrowing owl conservation region in Section M.2.1 (above) and summarized in Chapter 5. Since the North San José/Baylands region is the most important for burrowing owl conservation and has the most immediate conservation opportunities, 70% (3,700 acres) of the total land management should occur in that region. These management agreements would occur inside the permit area, including the expanded study area. In addition, 15% (800 acres) of the total land managed would occur in the Gilroy region. The remaining 15% should remain flexible and could occur in any of the regions, but we recommend that 5% (270 acres) occur in the South San José region and 10% (530 acres) occur in the Morgan Hill region.

## M.4.2 Overwintering Habitat

There are 132,770 acres of burrowing owl overwintering only modeled habitat within the study area. A total of 28,517 acres (21%) of overwintering modeled habitat are located in Type 1, 2, or 3 open space with 12,584 acres (9%) of that habitat permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 17,000 acres of modeled overwintering habitat for the Reserve System. In addition, 4,310 acres of overwintering modeled habitat for western burrowing owl will be added to the Reserve System from existing open space. Incorporation of County Park lands into the Reserve System (**Table 5-5** and **Figure 5-4**) will benefit the species by providing opportunities for habitat enhancement and long-term monitoring. All of these acquisitions and additions will increase the proportion of protected overwintering modeled habitat in the study area to 26% in Type 1 open space and 34% in Type 1, 2, or 3 open space (**Table 5-17**).

Modeled overwintering habitat for western burrowing owl will be permanently preserved, managed, and enhanced throughout the Reserve System in all major watersheds in the permit area. Overwintering habitat will be protected in low elevation grassland valleys in the Diablo Range that currently support California ground squirrels, have supported California ground squirrels since 1997, or are adjacent to lands with existing California ground squirrel colonies (LAND-G8). Low elevation valleys within the Reserve System that are located on the valley floor or in the Diablo Range will be managed to benefit nesting and overwintering burrowing owls. Some locations on the southern edges of the City of San José could support burrowing owls in the future. In addition, several acres will be acquired in the southern part of the permit area in the Pescadero watershed that could be converted to annual grassland and managed for western

burrowing owls. Nearly all land acquisition in areas dominated by annual grassland has the potential to benefit overwintering owls. Most of that land acquisition will occur along Coyote Ridge, west of Chesbro Reservoir, west and east of Calero Reservoir, and between Henry W. Coe State Park and the San Benito County line. This land acquisition has been primarily targeted for other covered species but will have incidental conservation benefit for western burrowing owls, especially during the winter months.

### **M.4.3 Reserve System Lands Selection Criteria**

Land that is acquired through fee title purchase or easement to meet biological goals and objectives for burrowing owl nesting and overwintering habitat in the Habitat Plan permit area will be selected using the reserve design principles in Chapter 5. All lands or easements will be acquired from willing sellers using the process defined in Chapter 8.

#### **Location Criteria**

When identifying and acquiring the 600 acres for permanent protection and enrollment into the Reserve System, the Implementing Entity will use the following guidelines.

1. The Implementing Entity will preferentially select a parcel that is inside of the Habitat Plan study area over a parcel that is inside of the expanded study area for burrowing owl conservation.
2. The Implementing Entity will preferentially select parcels that are closer (i.e., within 0.5 mile) to documented nest locations over those that are farther away.
3. Parcels that do not meet criteria 2 (above) may be considered on a case-by-case basis to allow the Implementing Entity to take advantage of unusual opportunities or circumstances<sup>3</sup>.

#### **Habitat Criteria**

The 600 acres of occupied nesting habitat acquired for the Reserve System must have the following:

1. Documented nesting burrowing owls on the parcel in at least one of the previous 3 years. Parcels that are currently occupied should be selected first, followed by parcels that have been occupied in the previous 3 years.

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<sup>3</sup> It is not the intent of the burrowing owl conservation strategy to permanently protect or permanently manage lands in urban areas that are anticipated to be developed (e.g., the North First Street area of San José).

2. Be surrounded by at least 140 acres of foraging habitat within 0.5 mile of a nest site (including the parcel where nesting was documented). If there is no potential for foraging habitat to be protected through future acquisition, conservation easement, or management agreement, the nest site should not be acquired unless long-term viability of the site can be in some other way demonstrated.
3. Currently supports ground squirrels or is located adjacent to another parcel with ground squirrels.
4. Currently support grassland, barren, or other land cover types that can be managed or modified to enhance the site to increase the habitat quality for burrowing owls.

## Parcel Criteria

All parcels considered for inclusion in the Reserve System and managed as burrowing owl habitat will meet the following criteria.

1. Parcel size is not a limiting factor on burrowing owl occupancy, however larger parcels will be favored over smaller parcels to maximize the benefits of conservation funding that will be generated under the Habitat Plan. Larger parcels will support more burrowing owls over the long term and provide both nest sites and foraging habitat. Further, larger parcels allow for more options for important management practices (e.g., grazing with sheep is more practicable on a larger parcel than on a smaller one).
2. Adjacent land uses should not constrain necessary management (e.g., seasonal mowing, winter disking, grazing, or other methods of vegetation removal). Fencing around the parcel must be feasible to control human and animal access. Control of non-native predators (e.g., feral cats, foxes) must also be feasible on the site.
3. Ground squirrel management will not occur on the parcel (see above), so adjacent land uses should be such that ground squirrel control will not be needed (e.g., levees, dams, ranchlands where ground squirrels are not desired).

## M.5 Management Techniques and Tools

The general principles for grassland management will be followed in all grassland or barren areas (Section 5.3.3, *Grassland Conservation and Management*). Management techniques may include any or all of those outlined in Section 5.3.3 *Grassland Conservation and Management*; however, those that will be most beneficial to burrowing owls are grazing and mowing.

Enhancement of sites supporting nesting or overwintering will include maintaining a maximum Effective Height of 5-inches (Green and Anthony 1989).

There are two time periods when this is important, before February 1<sup>st</sup>, so the grasses at the site will be short when owls are selecting nest sites, and following the growing season (dependent on rainfall), so grasses will remain short until the next growing season. Burrowing owl management areas will be assessed monthly to determine if additional mowing treatments are needed to meet the maximum Effective Height of 5-inches requirement. Further, all nesting and overwintering locations that are managed will have restrictions on California ground squirrel control (GRASS-5). On sites where owls are not currently nesting but where attracting owls is consistent with management goals and where California ground squirrels are not present, artificial burrows will be installed to make breeding and wintering sites available immediately for burrowing owls (GRASS-9) (Barclay 2008). Artificial burrows will be used as a temporary measure to encourage use by burrowing owls while long-term measures such as ground squirrel population enhancement are developed and implemented.

Grazing can be used to reduce the biomass or effective height of nonnative invasive species and to maintain structural heterogeneity within the natural community. Grazing is beneficial to burrowing owls because it keeps the vegetation short. Short vegetation is necessary for a site to serve as functional nesting habitat for burrowing owls. Most of the grazing in the permit area will be by livestock (GRASS-6). In some urban areas grazing with goats or sheep may be a better approach.

In some instances, mowing is a reasonable alternative to grazing, and mowing in selected areas is often an option when grazing is infeasible (e.g., urban sites) (GRASS-8). Mowing can also be safer and easier to implement on small isolated parcels, which suits burrowing owls better than any other covered species. In either case the goal of vegetation management will be to reduce the overall height and Effective Height of vegetation on burrowing owl habitat to optimal conditions for the species (GRASS-8). Deep ripping will not be performed in the Reserve System or management areas for the burrowing owl because it often destroys burrows and increases soil erosion. Using light disking outside of the nesting season may be used in select cases. The use of light disking will be evaluated on a case-by-case basis and will be used only when other forms of vegetation removal are not practical. Disking does not result in re-contouring of the landscape and will not affect site hydrology.

The Implementing Entity will allow and encourage colonization by California ground squirrels in managed grasslands and barren lands, excluding engineered levees and dams. This expansion of colonies will be monitored and only allowed in areas where conflicts with covered activities will be minimized (GRASS-5). To facilitate this expansion of California ground squirrel colonies the Implementing Entity will cease using rodenticides on managed lands except when needed to protect the integrity of structures such as levees and dams (reservoirs or stock ponds) or to prevent nuisance (as defined in the Fish and Game Code Sections 4150 and 4152) populations on adjacent private lands (GRASS-5). This may include relocating ground squirrels from areas where they are less desirable (dams, levees, golf courses, etc.) into areas where they are needed and their presence is compatible with surrounding land uses.

## M.6 Threats and Uncertainties

Burrowing owls have been reluctant to disperse very far from their natal burrows within Santa Clara County (J. Barclay pers. comm.). A conservation strategy that depends on individual owls dispersing from known breeding sites (e.g., San José International Airport) to newly protected sites is uncertain. Further, the success of the burrowing owl population at San José International Airport is not guaranteed over the long term. Should the breeding population at San José International Airport be reduced significantly in the future there will be far fewer burrowing owls to recolonize these newly protected areas.

The second most vigorous burrowing owl breeding population in the study area is at the San Jose/Santa Clara Water Pollution Control Plant buffer lands. Management of this area has varied in the recent past and there is no long-term guarantee that the burrowing owl population will persist at this site. Planned development of portions of this site would result in the loss of burrowing owl habitat.

Though habitat is managed for burrowing owls at several locations there are still uncertainties with these management programs. Changes in current management practices that benefit burrowing owls at Moffett Airfield, Shoreline Park, VTA's Cerone bus yard, and Mission College continue to be uncertain and planned future development at any of these sites would be a threat to burrowing owls and their habitat.

## M.7 References

- Barclay, J.H. 2008. A simple artificial burrow design for burrowing owls. *Journal of Raptor Research* 42(2):53–57.
- Barclay, Jack. Principal and senior wildlife biologist. Albion Environmental, Santa Cruz, CA. January, February 2007—meetings with Jones & Stokes staff.
- California Natural Diversity Database. 2009. California Department of Fish and Game. Updated as of July 2009.
- City of San José. 2000. Burrowing Owl Habitat Conservation Strategy and Implementation Plan. Draft Final Report. April. Department of Planning, Building and Code Enforcement. Prepared by Albion Environmental, Inc. San José, CA.
- DeSante, D.F. and E.D. Ruhlen. 1995. *A Census of Burrowing Owls in California, 1991–1993*. Point Reyes Station, CA: Institute for Bird Populations.



- DeSante, D.F., E.D. Ruhlen, and R. Scalf. 2007. The distribution and relative abundance of burrowing owls in California during 1991–1993: Evidence for a declining population and thoughts on its conservation. Pages 1–41 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- DeSante, D.F., E.D. Ruhlen, S.L. Adamany, K.M. Burton and S. Amin. 1997. A census of burrowing owls in central California in 1991. Pages 38–48 in Lincer, J.L. and K. Steenhof. (Eds.). 1997. *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Green, A.G. and R.G. Anthony. 1989. Nesting success and habitat relationships of burrowing owls in the Columbia basin, Oregon. *Condor* 91:347–354.
- Harman, L.M. and J.H. Barclay. 2007. A summary of California burrowing owl banding records. Pages 123–131 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.
- Townsend, S.E. and C. Lenihan. 2007. Burrowing owl status in the greater San Francisco Bay area. Pages 60–69 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). 2007. *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc. Point Reyes Station, CA, vii + 197 pp.

Appendix N

**Burrowing Owl Population Viability Analysis  
Santa Clara Valley Habitat Conservation Plan/  
Natural Communities Conversation Plan  
(HCP/NCCP)—March 2010**



SANTA CLARA COUNTY

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**BURROWING OWL POPULATION VIABILITY ANALYSIS  
SANTA CLARA VALLEY HABITAT CONSERVATION PLAN/  
NATURAL COMMUNITIES CONVERSATION PLAN (HCP/NCCP)**

MARCH 2010

ALBION ENVIRONMENTAL, INC.



SANTA CLARA COUNTY

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**BURROWING OWL POPULATION VIABILITY ANALYSIS  
SANTA CLARA VALLEY HABITAT CONSERVATION PLAN/  
NATURAL COMMUNITIES CONVERSATION PLAN (HCP/NCCP)**

MARCH 2010

PREPARED FOR:

COUNTY OF SANTA CLARA  
HCP/NCCP PROJECT TEAM

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## INTRODUCTION

The Santa Clara Valley HCP/NCCP (Plan) contains the biological goal and objective of increasing the size and distribution of the burrowing owl (*Athene cunicularia*) population in the Plan area. Implicit in this goal is the assumption that increasing the size and distribution of the burrowing owl population will increase the likelihood that a population of owls will persist into the future through the 50-year term of the Plan. This goal invites examination of the question of how large the burrowing owl population in the Plan area has to be so it has an acceptably high probability of persistence. This report contains a quantitatively-informed examination of this question by using count-based population viability analysis (PVA) techniques of three of the largest extant burrowing owl colonies in the Santa Clara Valley at Mineta San Jose International Airport (SJC), NASA Ames Research Center/Moffett Field (Moffett), and Shoreline at Mountain View (Shoreline).

Results of the statewide burrowing owl survey in 1991-1993 (DeSante et al. 1997, 2007), and surveys for nesting burrowing owls in the Plan area in 2000 (Albion Environmental, Inc. 2000) and 2008 (Albion Environmental, Inc. 2008) suggest the population of nesting burrowing owls in Santa Clara County has declined in recent decades (also see discussion in Townsend and Lenihan 2007). Conclusions about the magnitude of decline have been based on different sources of information including anecdotal evidence from previous years (DeSante et al. 1997, 2007, Townsend and Lenihan 2007) or changes in abundance at individual colonies (Barclay 2007 for SJC; Trulio 1997 and Trulio and Chromczak 2007 for Moffett and Shoreline). DeSante et al. (1997, 2007) estimated the San Francisco Bay area burrowing owl population from 153 -165 pairs in the early 1990s and suggested a 50% decline since the late 1980s. Information about owl abundance in the City of San Jose also suggested an approximately 50% decline: from 43-47 pairs in 1997, to 39-40 pairs in 2000 and 20-21 pairs in 2008. To date there has been no quantitative analysis of population growth rate and variance using the same analytical method for the three best-studied burrowing owl colonies in Santa Clara County.

The goals of this analysis are to:

1. Quantify population size, growth rate and variance in the burrowing owl colonies at SJC, Moffett, and Shoreline in recent years,
2. Evaluate the probability of persistence of these colonies (individually and combined) using population growth and variance over recent years, and
3. Make an informed recommendation about how the conservation measures for burrowing owls could be constructed to increase the chances of meeting the Plan's biological goals and objectives for burrowing owls.

## METHODS

I used count-based PVA methods described by Dennis et al. (1991), Morris et al. (1999), and Morris and Doak (2002) using annual counts of adult (i.e.,  $\geq 1$  year old) burrowing owls recorded during the early part of the nesting cycle at SJC, Moffett, and Shoreline for the years shown in Table 1. Assumptions of count-based PVA include (Morris et al. 1999, Morris and Doak 2002):

1. The data represent exhaustive counts of a subset of individuals (i.e., adults) comprising a fraction of the entire population that does not change over time.
2. Year-to-year variation in the counts reflects the true magnitude of environmentally-driven variation, censuses were performed in a sufficient number of years (at least 10) to accurately assess year-to-year variation in population growth rate, and variation in counts must not be due primarily to observation error in estimating population size each year.
3. Inter-annual environmentally-driven variation is not extreme and there are no large-magnitude fluctuations caused by extreme catastrophes or unusually good years.
4. The population growth rate is not affected by density and does not change as the population increases or decreases.

Other conditions that affect the precision of estimates of persistence include the absence of autocorrelation (e.g., an increase following an increase or decline following decline) and no significant change in the growth rate over time (Morris and Doak 2002).

Implicit in this analytical technique is the assumption that environmental effects on vital rates (i.e., birth rates and death rates) and immigration and emigration are summarized in annual numbers of adult owls (Morris and Doak 2002).

Annual (t) population growth rate  $\lambda$  (lambda) was calculated as:

$$\lambda_t = N_{t+1}/N_t$$

Where  $N_t$  = number of adult owls in year t.

The geometric mean of  $\lambda$  ( $\lambda_G$ ) expresses population growth and is the value that gives the same average annual population growth rate as observed over a long sequence of stochastically varying growth rates (Morris and Doak 2002). The geometric mean is used because it better represents exponential growth of populations than the arithmetic mean. Stochastic population growth  $\mu$  (mu) was calculated as:

$$\mu = \log \lambda_G \approx (\log \lambda_t + \log \lambda_{t-1} + \log \lambda_{t-2} + \dots + \lambda_2 + \lambda_1 + \lambda_0) / t$$

The variance in the rate at which  $\mu$  changes over time is expressed as  $\sigma^2$  (sigma squared) and is approximated by the variance of the  $\log \lambda_t$  values (Morris and Doak 2002).

These equations predict that if  $\mu > 0$ , then  $\lambda_G > 1$ , and most population trajectories will grow and if  $\mu < 0$ , then  $\lambda_G < 1$ , and most trajectories decline. The more the population growth rate  $\lambda$  varies from year to year as a result of environmental and demographic stochasticity the greater will be the value of  $\sigma^2$  and the greater the range of possible population sizes in the future (Morris and Doak 2002). Greater variance leads to less precise predictions of persistence (Morris and Doak 2002).

The probability of a population with parameters  $\mu$  and  $\sigma^2$  reaching a user-defined extinction threshold (i.e., quasi-extinction threshold) is based on diffusion approximation theory and the cumulative distribution function (CDF) (Morris and Doak 2002). The quasi-extinction threshold is a selected number for the purpose of comparing relative extinction risk of two or more populations rather than predicting when the last individual dies and the population is functionally extinct, which becomes

imprecise with time (Morris and Doak 2002). Dennis et al. (1991), Morris et al. (1999), and Morris and Doak (2002) discuss the theoretical underpinnings of extinction approximation and CDF.

### **Annual number of adult burrowing owls**

Annual numbers of adult burrowing owls at SJC represent the number of adult owls recorded in March or April as reported in annual breeding burrowing owl reports for SJC (Albion Environmental, Inc. 1997-2009, Barclay 2007). I selected the number of adult burrowing owls at Moffett from data supplied by C. Alderete (PAI Corporation) and the number of adult owls in March or April from data supplied by S. Kleinhaus (Santa Clara Valley Audubon Society) for Shoreline (Table 1, Figure 1).

I performed count-based PVA for each colony for the respective time periods for which adult count data were available (Table 1, Figure 1). I also analyzed a combined data set consisting of annual numbers of adult owls at SJC, Moffett, and Shoreline for the 11 year period 1999-2009 when adult count data were available for all three colonies (Table 1). For comparison to show a different growth rate for a similar-sized burrowing owl colony approximately during the same time period, I conducted the same analysis of adult burrowing owls at Sharpe Depot in San Joaquin County during 1997-2009 (Albion Environmental, Inc. annual breeding burrowing owl census reports, 1997-2009).

I simulated population growth in the Santa Clara County owl population by increasing the total population of adult owls (as of 2009), instantaneously and incrementally over time. Increasing the population enabled evaluation of the influence of future Plan conservation measures to support a larger burrowing owl population and how simulated population growth affected population persistence. Analyses were done with a count-based PVA tool obtained from Sinauer Associates (www.sinauer.org obtained October 2009).

## **RESULTS**

### **Trends**

Each of the burrowing owl colonies at SJC, Moffett, and Shoreline showed declining trends (i.e.,  $\mu < 0$ ) over their respective time periods (Table 1, Figure 1). SJC and Moffett showed very similar magnitudes and variance of decline compared to Shoreline that showed a greater magnitude and variance of decline (Table 1). However, the 95% confidence limits (CL) of decline ( $\mu$ ) for each colony ranged from negative to positive (i.e., spanned equilibrium) (Table 1).

The combined numbers of adult owls in all three colonies for the 11-year period 1999-2009 also showed a declining trend and relatively high variance (i.e.,  $\sigma^2 \geq 2\mu$ , Morris and Doak 2002) (Table 1).

### **Probability of persistence**

The colonies at SJC and Moffett showed similar probabilities of persistence represented by the mean and 95% CL of the probability of reaching a quasi-extinction threshold of two adult owls (Figure 2). These two colonies showed similar probabilities of quasi-extinction at 50 years: 0.5293 (0-0.9936) at SJC and 0.5256 (0-0.9954) at Moffett (Table 1). Shoreline showed a higher probability of reaching the quasi-extinction threshold of two adults (Figure 2), due to the smaller size of this colony and greater decline and variance (Table 1).



The probability of quasi-extinction, set at six adults (representing two adults at each colony) for the combined counts (Figure 3) was slightly higher (0.06909, 0-0.996) than for the individual colonies at SJC and Moffett (Table 1).

## DISCUSSION

As an example of the effect of a positive growth rate ( $\mu$ ) on population persistence Figure 4 shows annual counts of adult burrowing owls at Sharpe Depot in San Joaquin County for 1997-2009 (Albion Environmental, 1997-2009). The mean probability of persistence coincides with the x-axis (i.e., zero) although the 95% CL show that this colony still has a fairly high probability of quasi-extinction (2 owls) with time (95% CL ~ 90% at 50 years), due to the wide confidence limits of  $\mu$  (-0.1070 – 0.2225) and variance ( $\sigma^2 = 0.0672$ ) (Figure 4).

In order to evaluate the effect of population size on population persistence, I experimentally doubled the combined 2009 population of adults at the three colonies (51 adults, Table 1) to 102 and show the probability of persistence CDF in Figure 5 (top). The best estimate of reaching the quasi-extinction threshold in 50 years is 0.5363 (95% CL 0 – 0.991). Because doubling the population size did not substantially lower the probability of quasi-extinction (compare with Figure 3 bottom) I increased the population to 204 (i.e., 4 x the 2009 population) and show the probability of quasi-extinction CDF in Figure 5 (bottom). In this case the best estimate of quasi-extinction in 50 years declined to 0.3836 (95% CL 0-9982).

While increasing population size lowered the mean probability of extinction, the 95% confidence limits still approach 100% in about 30 years (Figure 5). These analyses show that population size alone does not increase the probability of persistence to an acceptably high level. One of the reasons is that instantaneously increasing population size does not reverse the declining trend from the previous 11 years in the three major colonies during 1999-2009 (Table 1). This suggests that in order for burrowing owls to have a higher probability of persistence during the 50-year term of the Plan the population growth rate will have to change from a decreasing trend ( $\mu < 0$ ) to an increasing trend ( $\mu > 0$ ).

To assess how long it might take to achieve a positive growth rate, I incrementally increased the population at the three colonies combined (51 adults) in 2009 by three percent per year (rounded to whole integers) until  $\mu$  changed to positive. Figure 6 shows that it took 16 years of three percent increase per year to obtain a positive growth rate. The probability of quasi-extinction CDF of the resulting population (Figure 6 bottom) shows how a positive growth rate increases the chances of population persistence.

## RECOMMENDATIONS

The PVA of burrowing owls in the Santa Clara Valley demonstrates that population persistence is not based solely on numbers, but rather it will be necessary to reverse the negative growth rate observed in the three largest local burrowing owl colonies during the last 11 years in order to reduce the probability of extinction to an acceptably low level (Figure 6). To accomplish this, the Plan's conservation goals and objectives should contain provisions to conserve and manage nesting habitat in optimum condition as soon as practicable after Plan approval to enable the local burrowing owl population to increase.

Second, the Plan should contain a detailed annual monitoring protocol (Morris et al. 1999, Morris and Doak 2002) designed to yield thorough annual counts of adult owls at a consistent subset of locations occupied by nesting burrowing owls. These could include colonies at SJC, Moffett, Shoreline, Alviso area, Mission College, Warm Springs District. Annual adult counts at a consistent subset of breeding sites should be included in annual on-going count-based PVA updates to enable monitoring of population trend and variance during the term of the Plan. Finally, success criteria for burrowing owl conservation in the Plan should be evaluated in terms of annual adults and annual monitoring of the growth rate ( $\mu$ ).

## REFERENCES

- Albion Environmental, Inc. 2000. Burrowing owl status in the City of San Jose in 2000. Unpublished report.
- Albion Environmental, Inc. 2008. 2008 Nesting burrowing owl survey, Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP). Unpublished report.
- Barclay, J. H. 2007. Burrowing owl management at Mineta San Jose International Airport. Pages 146-154 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc.
- Dennis, B., P.L. Munholland, and J.M. Scott. 1991. Estimation of growth and extinction parameters for endangered species. *Ecological Monographs* 61(2): 115-143.
- DeSante, D.F., E.D. Ruhlen, S.L. Adamany, K.M. Burton, and S. Amin. 1997. A census of Burrowing Owls in central California in 1991. Pages 38-48 in J.L. Lincer and K. Steenhof (Eds.), *The Burrowing Owl, its biology and management: including the proceedings of the First International Symposium*. Raptor Research Report No. 9.
- DeSante, D.F., E.D. Ruhlen, and R. Scaff. 2007. The distribution and relative abundance of Burrowing Owls in California during 1991-1993: evidence for a declining population and thoughts on its conservation. Pages 1-41 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc.
- Morris, W., D. Doak, M. Groom, P. Kareiva, J. Fieberg, L. Gerber, P. Murphy, and D. Thomson. 1999. A practical handbook for population viability analysis. The Nature Conservancy.
- Morris, W.F. and D. F. Doak. 2002. Quantitative Conservation Biology: theory and practice of population viability analysis. Sinauer Associates, Inc. Sunderland, MA.
- Townsend, S.E. and C. Lenihan. 2007. Burrowing owl status in the greater San Francisco Bay Area. Pages 60-69 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc.
- Trulio, L. 1997. Burrowing owl demography and habitat use at two urban sites in Santa Clara County, California. Pages 84-89 in J.L. Lincer and K. Steenhof (Eds.), *The Burrowing Owl, its biology and management: including the proceedings of the First International Symposium*. Raptor Research Report No. 9.
- Trulio, L.A. and D.A. Chromczak. 2007. Burrowing owl nesting success at urban and parkland sites in northern California. Pages 115-122 in Barclay, J.H., K.W. Hunting, J.L. Lincer, J. Linthicum, and T.A. Roberts (Eds.). Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1. The Institute for Bird Populations and Albion Environmental, Inc.

Table 1. Adult burrowing owl counts and count-based population viability analysis parameters for colonies at Mineta San Jose International Airport (SJC), NASA Ames Research Center/Moffett Field (Moffett), and Shoreline at Mountain View (Shoreline) and combined counts for all three colonies for 1999-2009.

Year	SJC <sup>1</sup>	Moffett <sup>2</sup>	Shoreline <sup>3</sup>	SJC, Moffett, Shoreline combined
1990	28			
1991	14			
1992	17	39		
1993	31	50		
1994	21	43		
1995	20	39		
1996	20	42		
1997	31	41		
1998	51	50		
1999	50	20	11	81
2000	42	38	22	102
2001	62	32	18	112
2002	82	36	18	136
2003	62	34	20	116
2004	49	51	21	121
2005	47	24	11	82
2006	50	24	18	92
2007	34	32	21	87
2008	17	16	9	42
2009	19	26	6	51
No. of years	20	18	11	11
Mean $\lambda$	0.9798	0.9764	0.9412	0.9411
(95% CL)	(0.8185 - 1.1728)	(0.7827 - 1.2180)	(0.6681 - 1.3257)	(0.6681 - 1.3257)
$\mu$	-0.0204	-0.0238	-0.0606	-0.0462
(95% CL)	(-0.2003 - 0.1594)	(-0.2449 - 0.1972)	(-0.4032 - 0.2819)	(-0.2649 - 0.1724)
$\sigma^2$	0.1392	0.1850	0.2293	0.0934
Probability of quasi- extinction at 50 years (95% CL)	0.5192 (0 - 0.9936)	0.5256 (0 - 0.9954)	0.9156 (0.0018 - 0.9999)	0.6909 (0 - 0.9996)
Quasi- extinction threshold	2	2	2	6

<sup>1</sup> Source: J. Barclay, Albion Environmental, Inc., annual burrowing owl breeding summary reports 1990-2009

<sup>2</sup> Source: C. Alderete, PAI Corporation, NASA Ames wildlife biologist

<sup>3</sup> Source: S. Kleinhaus Santa Clara Valley Audubon Society from P. Delevoryas and P. Higgins

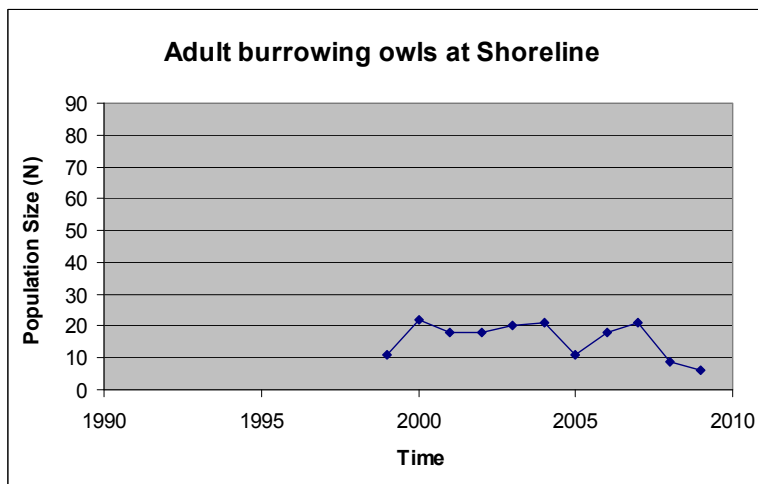
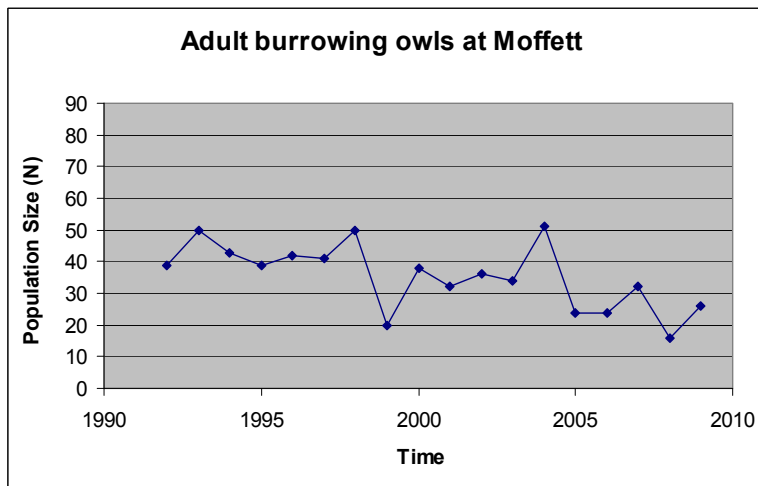
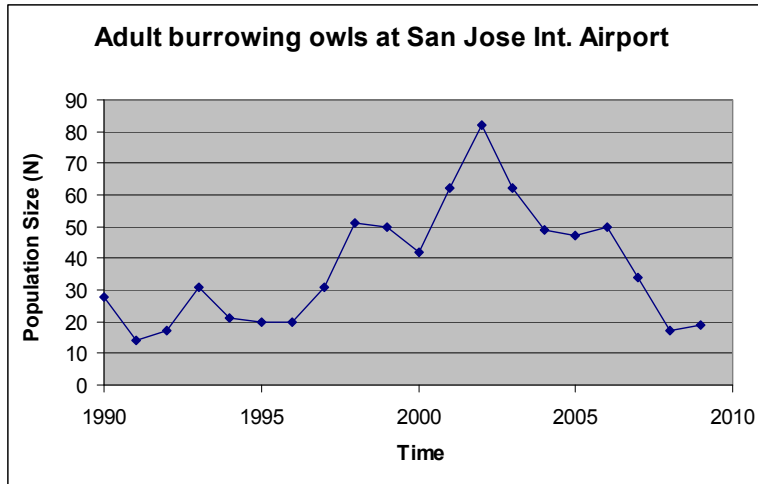


Figure 1. Adult burrowing owl counts at SJC (1990-2009), Moffett (1992-2009), and Shoreline (1999-2009) used in individual colony count-based population viability analysis.

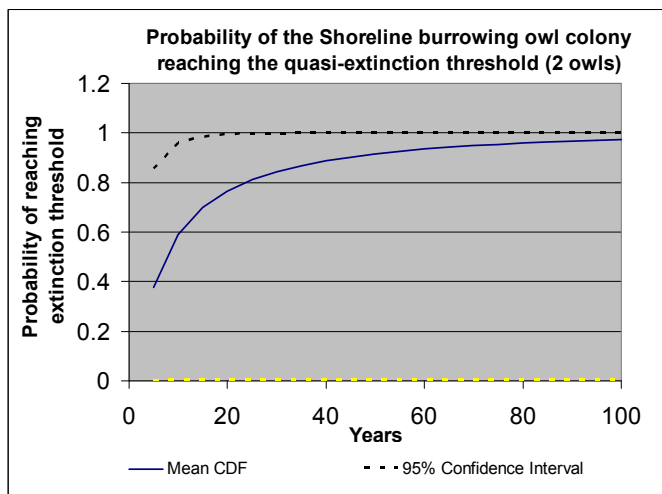
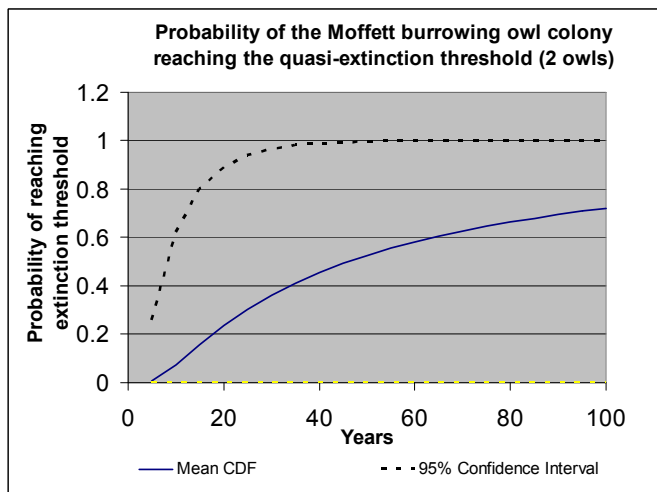
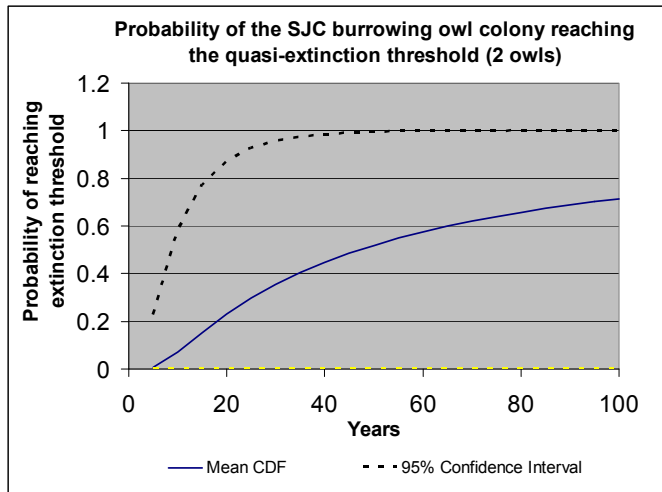


Figure 2. Probabilities of the burrowing owl colonies at SJC, Moffett, and Shoreline reaching a quasi-extinction threshold of two owls based on cumulative distribution function (CDF).

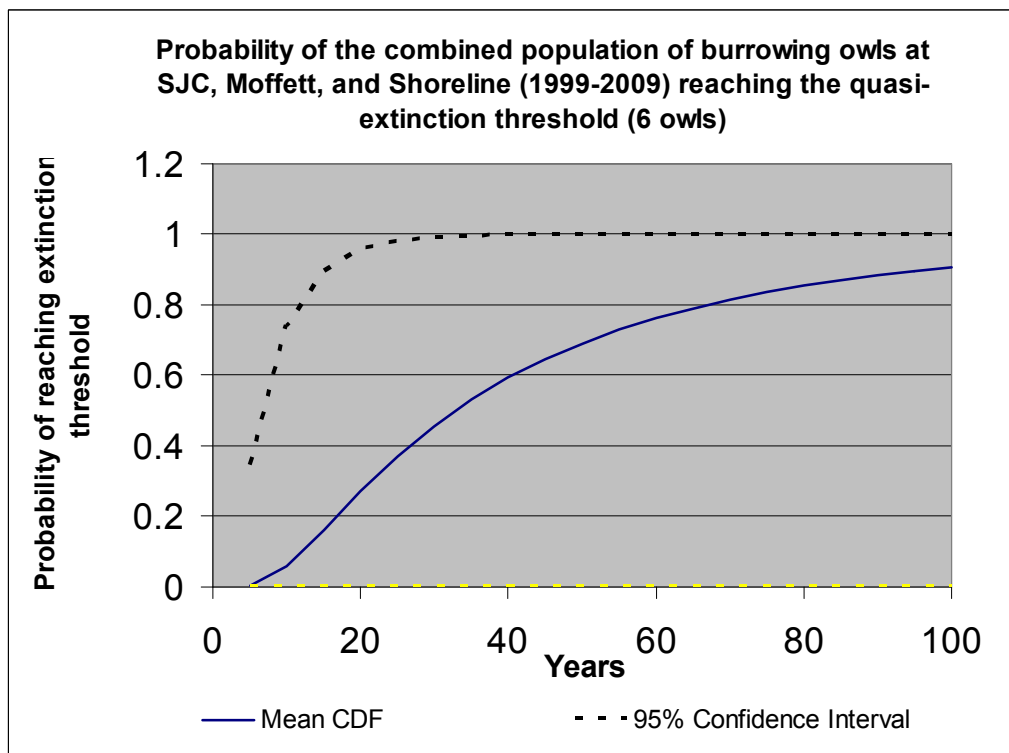
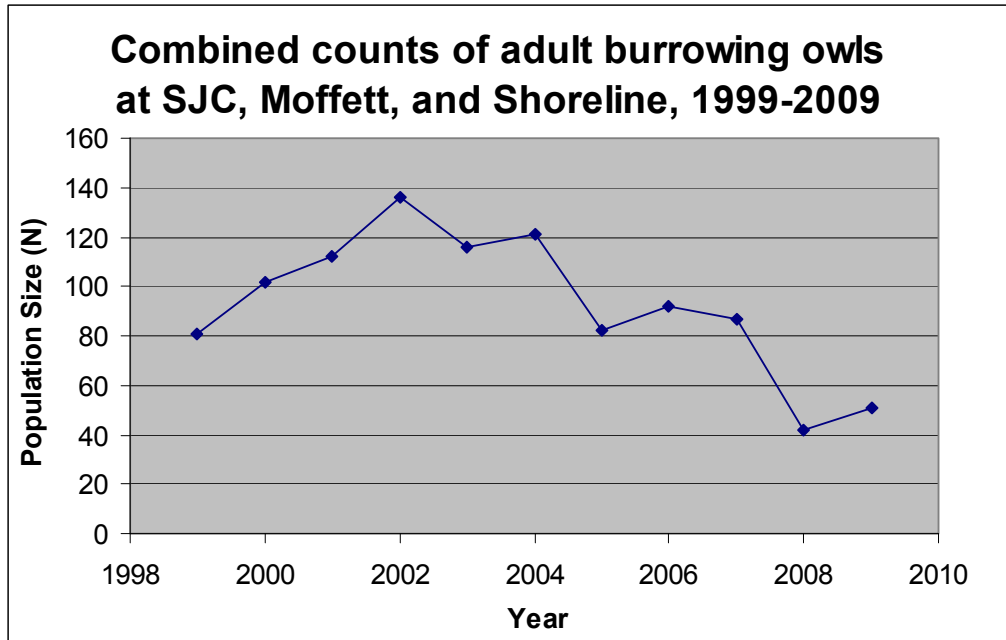


Figure 3. Combined counts of adult burrowing owls at SJC, Moffett, and Shoreline for the years 1999-2009 (top graph) and probability of the combined population reaching a quasi-extinction threshold of six owls (bottom graph): mean  $\lambda = 0.9547$  (95% CL 0.7672 - 1.1881),  $\mu = -0.0462$  (95% CL -0.2649 - 0.1724),  $\sigma^2 = 0.0934$ .

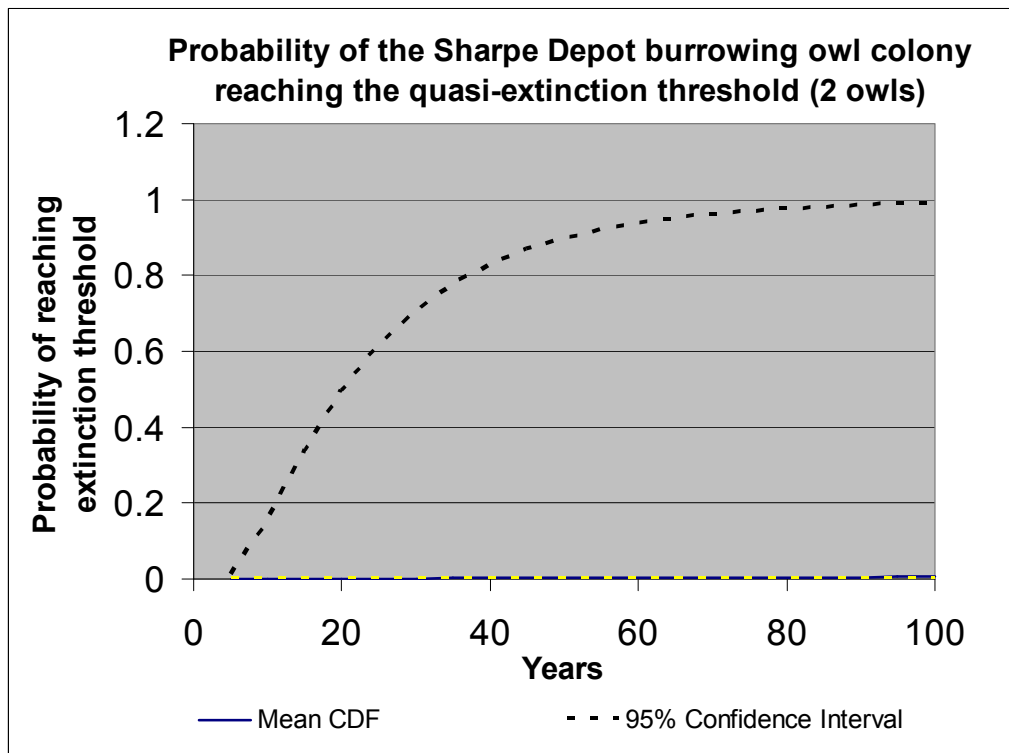
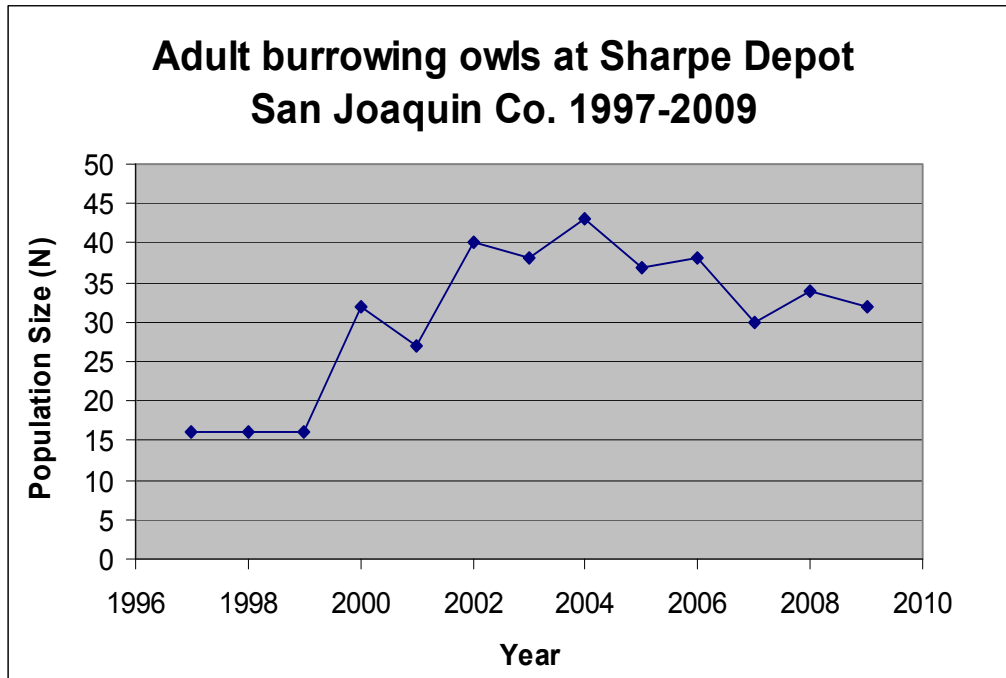


Figure 4. Adult burrowing owl counts at Sharpe Depot from 1997-2009 (top graph) and probability of the colony reaching a quasi-extinction threshold of two owls (bottom graph): mean  $\lambda = 1.0595$  (95% CL 0.89840 – 1.2492),  $\mu = 0.0577$  (95% CL -0.1070 – 0.2225),  $\sigma^2 = 0.0672$ ).



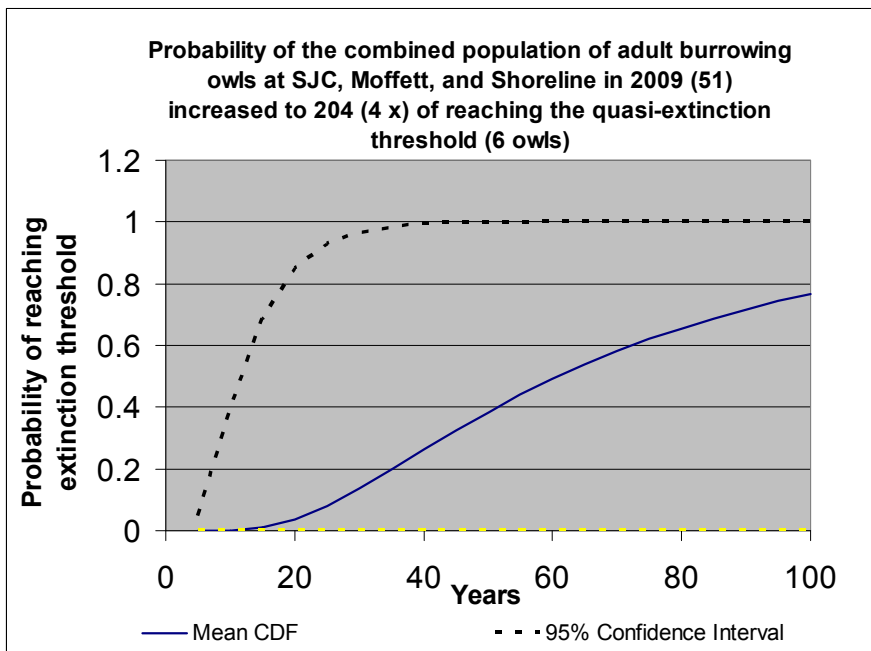
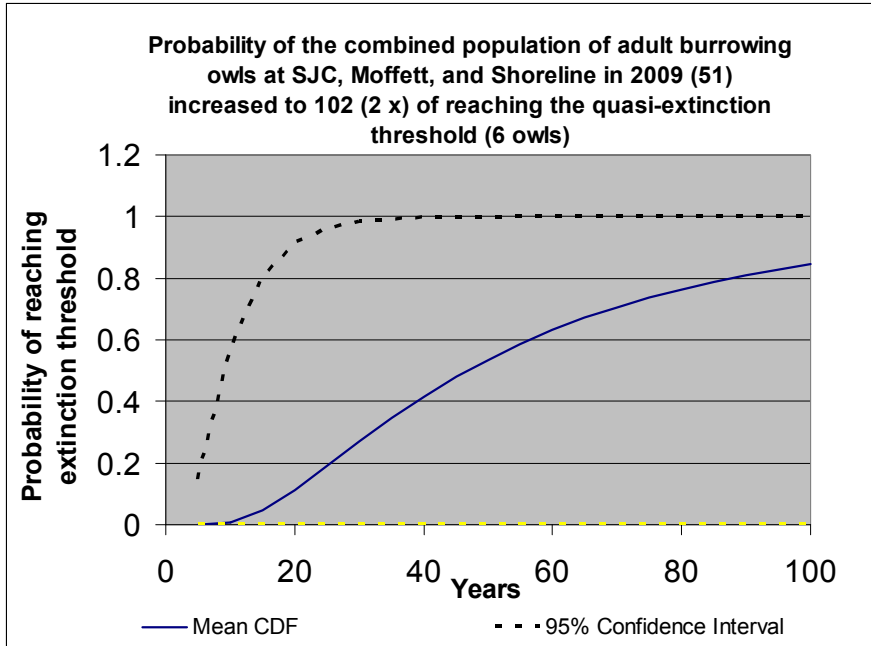


Figure 5. Probability of the adult burrowing owl population at SJC, Moffett, and Shoreline in 2009 (51 adults) increased 2 x (top graph) and 4 x (bottom graph) of reaching a quasi-extinction threshold of six owls.

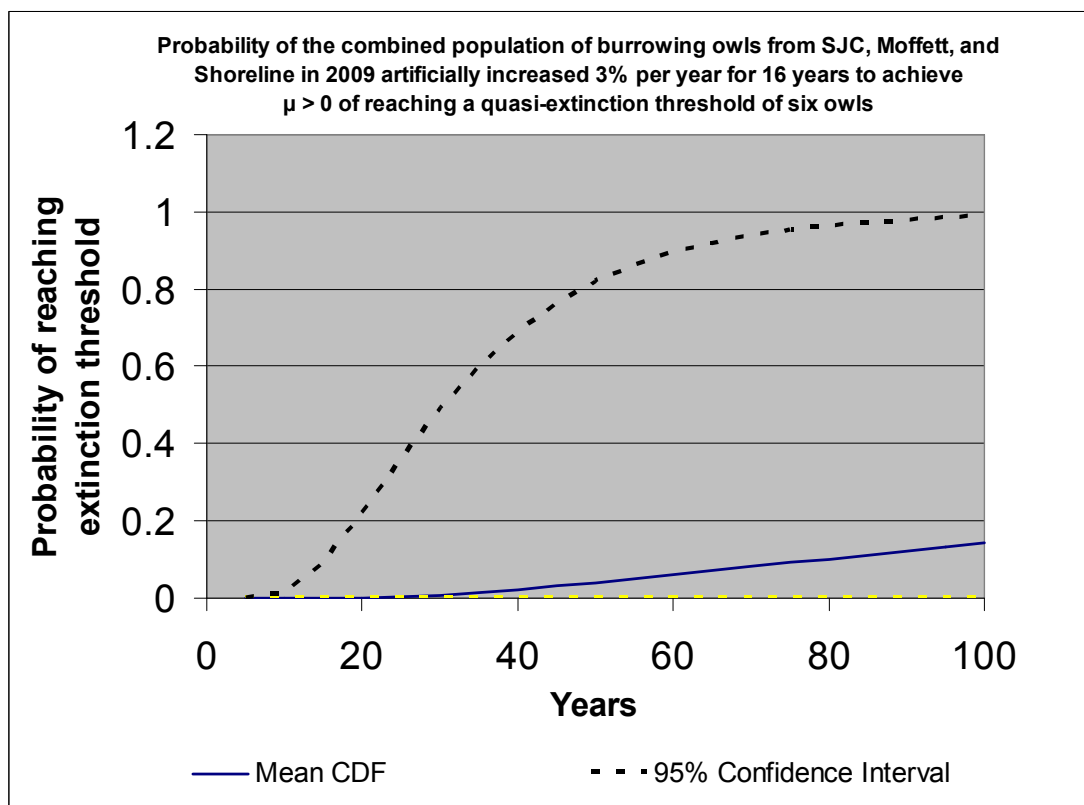
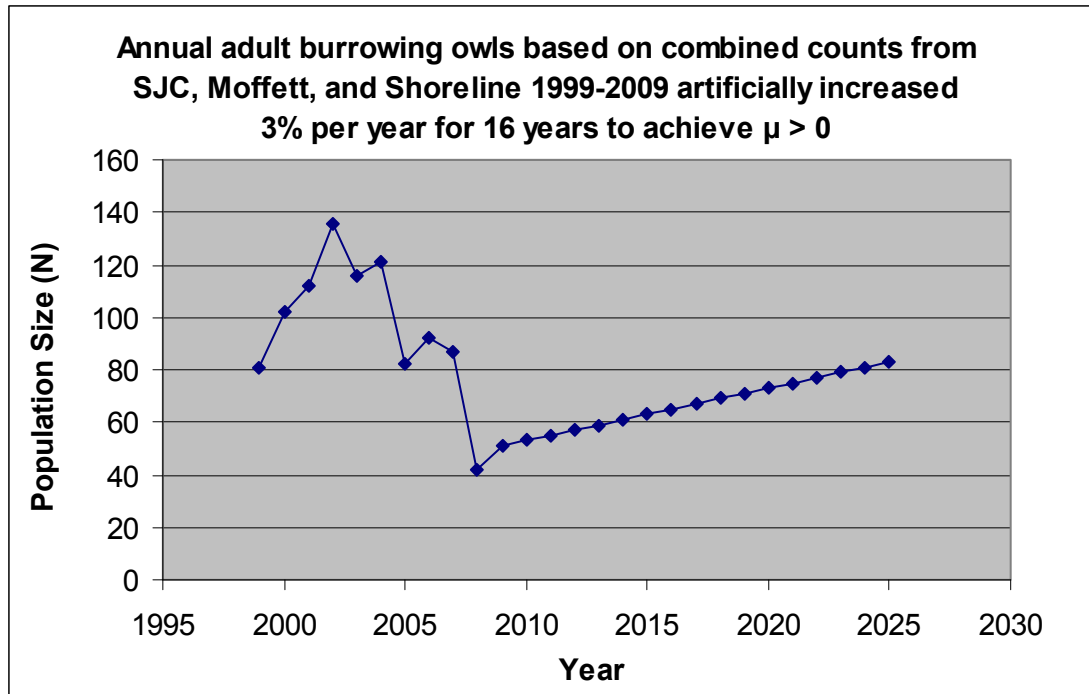


Figure 6. Adult burrowing owls at SJC, Moffett, and Shoreline 1999-2009 artificially increased 3% per year to achieve  $\mu > 0$  (top graph) and probability of the resulting population: mean  $\lambda = 1.0009$  (95% CL 0.9279 – 1.0796),  $\mu = (0.0009$  (95% CL -0.0747 – 0.0766),  $\sigma^2 = 0.0351$ , reaching a quasi-extinction threshold of six owls.



## **List of Acronyms and Abbreviations**



# List of Acronyms and Abbreviations

°C	degrees Centigrade
°F	degrees Fahrenheit
ADA	Americans with Disabilities Act
ATV	all-terrain vehicles
BA	biological assessment
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
BMPs	best management practices
BO	biological opinion
Cal-Fire	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMAQ	Community Multiscale Air Quality modeling system
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
County	Santa Clara County
County Parks	County of Santa Clara, Parks and Recreation Department
CPI	Consumer Price Index
County Parks Strategic Plan	Strategic Plan for the Santa Clara County Parks and Recreation System
CSC	California species of special concern
CWA	Clean Water Act
CWMZs	Cold Water Management Zones
DEM	Digital Elevation Models
DSOD	California Division of Safety of Dams
Eagle Act	Bald and Golden Eagle Protection Act
EIR	environmental impact report
EIS	environmental impact statement

EIS/EIR	environmental impact statement/environmental impact report
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
FAA	Federal Aviation Administration
FAHCE	Fisheries and Aquatic Habitat Collaborative Effort
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FR	Federal Register
GIS	geographic information systems
HCP	habitat conservation plan
HPI	Home Price Index
I-680	Interstate 680
IA	implementing agreement
IPM	integrated pest management
JPA	Joint Powers Authority
km <sup>2</sup>	square kilometers
LAFCO	Local Agency Formation Commission
LAIF	Local Agency Investment Fund
MBTA	Migratory Bird Treaty Act of 1918, as amended
MIG	Moore Iacofano Goltsman
MIST	minimum impact suppression tactics
Moore Foundation	Gordon and Betty Moore Foundation
MOU	memorandum of understanding
msl	above mean sea level
NCCP	natural community conservation plan
NCCP Act	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO <sub>2</sub>	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO <sub>x</sub>	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
Open Space Authority	Santa Clara Valley Open Space Authority

Packard Foundation	David and Lucile Packard Foundation
PAR	Property Analysis Report
PG&E	The Pacific Gas and Electric Company
Plan	Santa Clara Valley Habitat Plan
POST	Peninsula Open Space Trust
PVA	population viability analysis
Regional Boards	Regional Water Quality Control Boards
RGP	Regional General Permit
SCADA	supervisory control and data acquisition
SCJAP	South County Joint Area Plan
SCVWD	Santa Clara Valley Water District
Semitropic	Semitropic Water Storage District
SFPUC	San Francisco Public Utilities Commission
SOD	sudden oak death
SR	State Route
SRA	Shaded Riverine Aquatic
State Board	State Water Resources Control Board
State Parks	California Department of Parks and Recreation
Three Creeks HCP	Three Creeks Habitat Conservation Plan
TMDLs	Total Maximum Daily Loads
TNC	The Nature Conservancy
U.S.	U.S. Highway
UGB	urban growth boundary
ULL	urban limit line
USA	urban service area
USB	urban service boundary
USC	U.S. Government Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTC	United Technologies Corporation
VTa	Santa Clara Valley Transportation Authority
VTM	Vegetation Type Map
VTP 2035	Valley Transportation Plan 2035
Wildlife Agencies	U.S. Fish and Wildlife Service and California Department of Fish and Game



